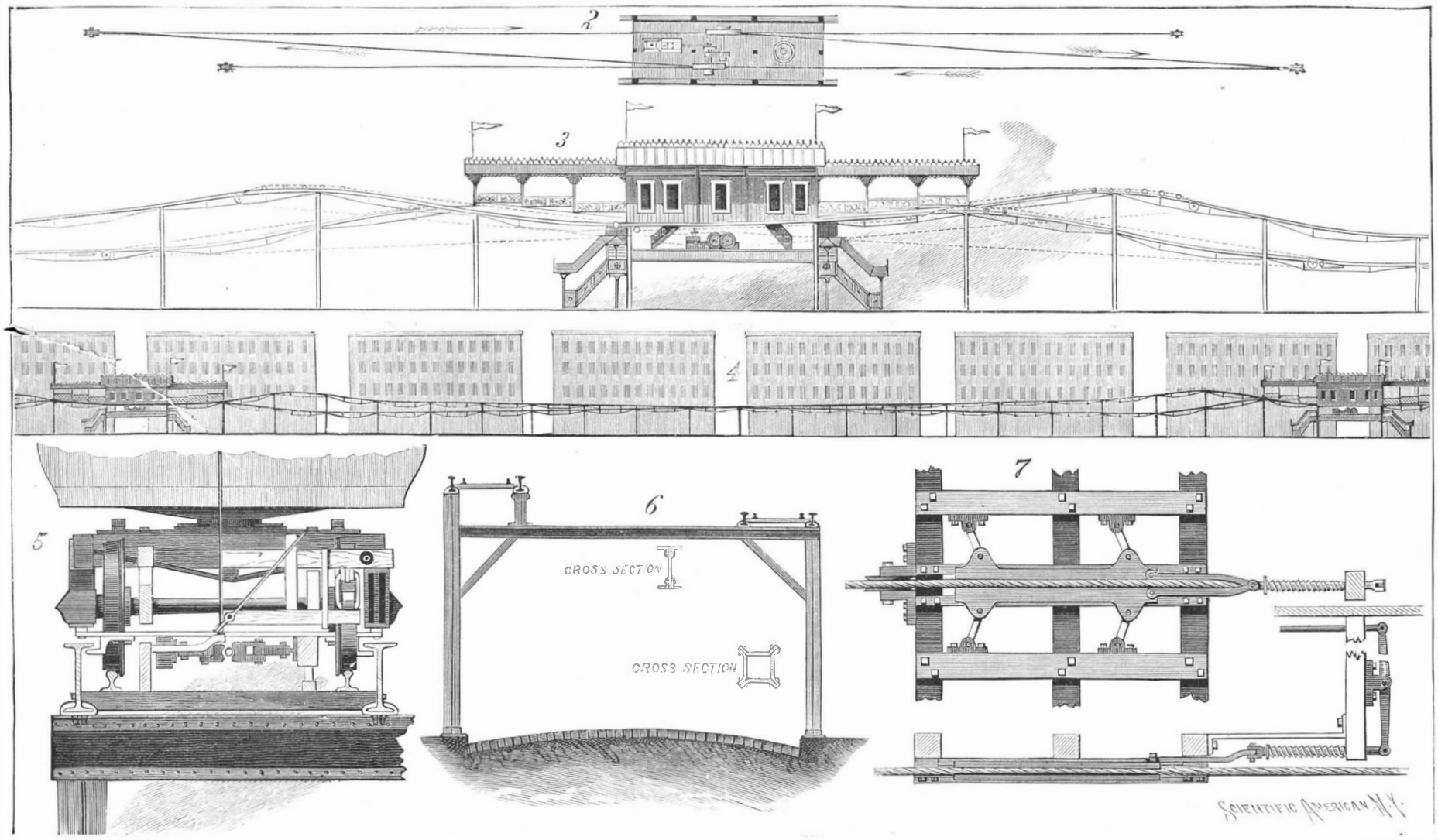
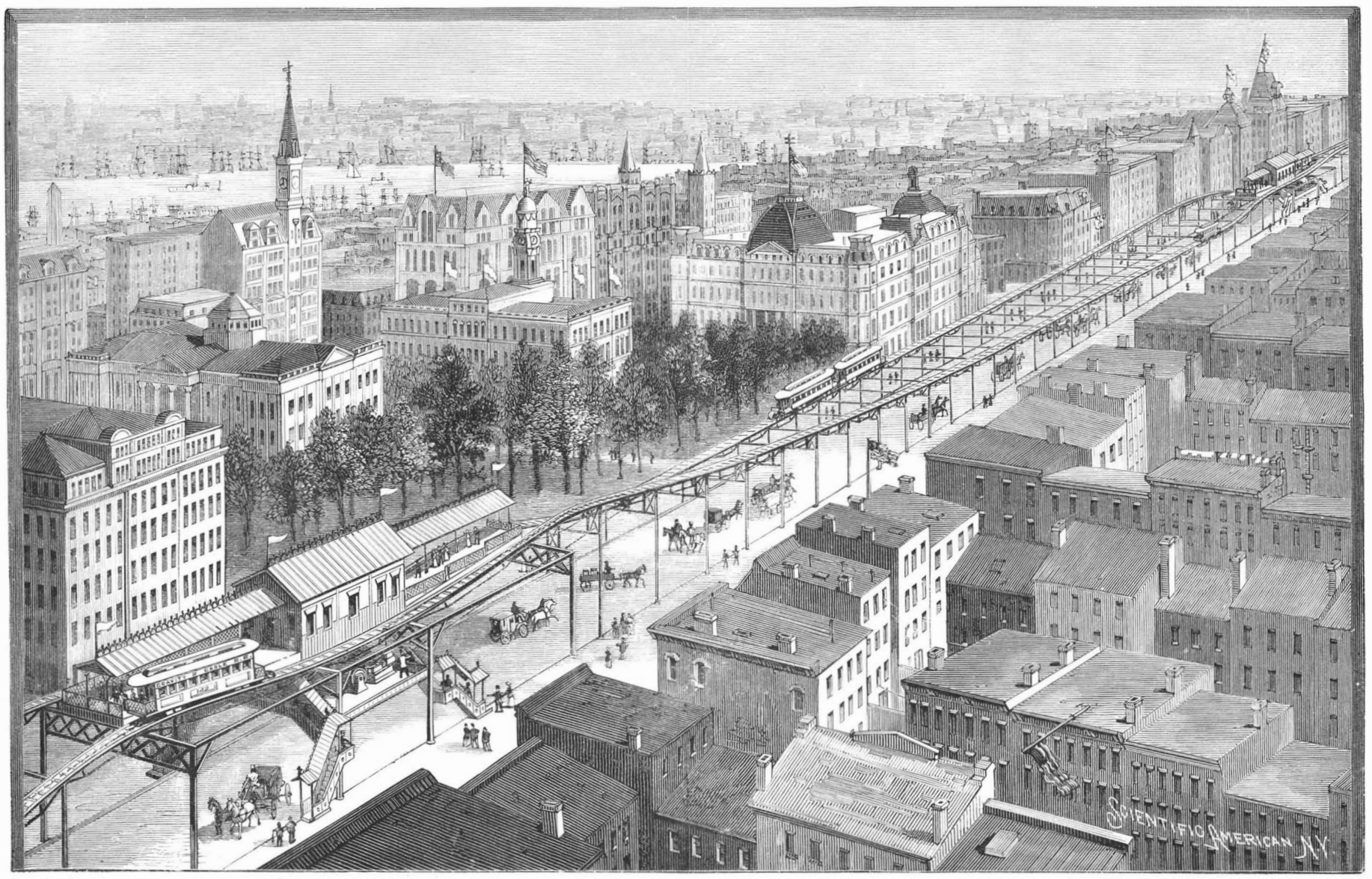
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1888, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

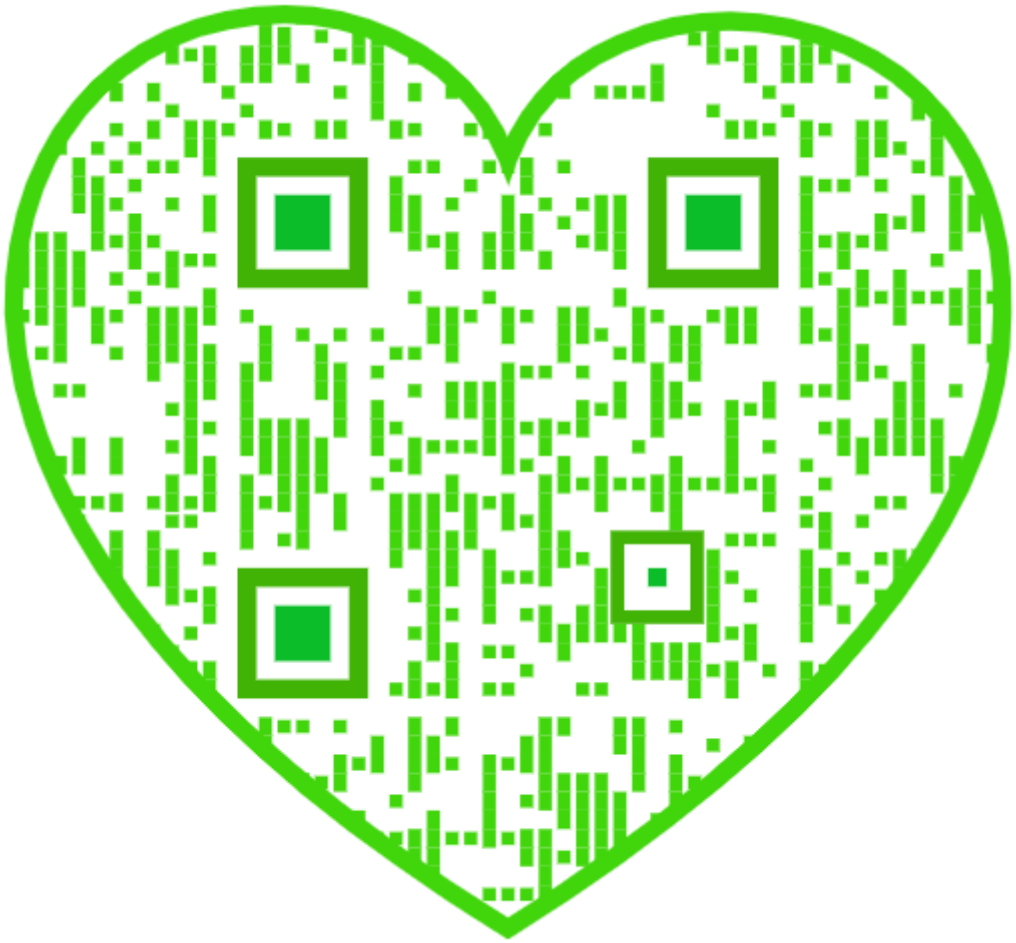
Vol. LIX.—No. 10. ESTABLISHED 1845. NEW YORK, SEPTEMBER 8, 1888. $3.00 A YEAR. WEEKLY.





THOMPSON'S GRAVITY SYSTEM FOR RAPID TRANSIT IN TOWNS AND CITIES.—[See page 149.]

© 1888 SCIENTIFIC AMERICAN, INC.



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S. or Canada.....$3 00
One copy, six months, for the U. S. or Canada..... 1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00
Remit by postal or express money order.

Australia and New Zealand.—Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit £1 in current Colonial bank notes. Address

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S. and Canada. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S. or Canada, on receipt of *seven dollars*.

The safest way to remit is by draft, postal order, express money order, or registered letter.

Australia and New Zealand.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for a little over one year on receipt of £2 current Colonial bank notes.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, SEPTEMBER 8, 1888.

Contents.

(Illustrated articles are marked with an asterisk.)

Aluminum and sodium, Castner's process for 151
Battery, porous cup, improved*. 147
Boulogne-sur-mer* 150
Business and personal 154
Butter, "dairy" 152
Canvasser, the 152
Case, file, improved* 146
Clamp for hanging wall paper* .. 146
Cooper, Eli, at the age of 81* 153
Electrical Lighting Convention Notes 144
Electric Light Association, National, Convention 145
Excitement, does it shorten life? 144
Finder, position, Watkin 144
Flavors, artificial, how made 152
Food, adulteration of 153
Gravity system, Thompson's, for rapid transit in cities and towns* 143, 149
Greif, fastest armed cruiser 148
Hydrophobia, curious treatment for 149
Hydrographic expedition 153
Inventions, engineering 154
Inventions, index of 155
Inventions, miscellaneous 154
Law, vagaries of the 148
Lighting in city and country 149
Locomotive, our first imported, history of* 153
Louisiana, southern, notes on 150
Lucigen* 147
Mercury, thermic conductibility 149
Meteorite 145
Monte-Christi 152
Navy, work in 153
Notes and queries 154
Oil on the waters as a preventive of fogs 149
Papers, bottle 153
Pass, railway, a perpetual 144
Printing, blue 149
Reel, hose, all-iron* 146
Restaurants, Chinese 145
Sans Pareil, new battle ship 150
Shells, experiments with 147
Spinning, cotton, English 144
Stand, window, for flowers* 146
Strap, box, wire* 146
Strip, weather, improved* 146
Terminus, passenger, largest in London 152
Termite pest of the old world* ... 151
Trains, fast 148
Trains, passenger, speed of 148
Trestle, long 143
Wrench, improved* 147
Yeast, purification of 146

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 662.

For the Week Ending September 8, 1888.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ASTRONOMY.—The Physical Aspect of the Planet Mars.—The parallel canals of Mars and the different hypotheses to account for them.—1 illustration 10579

II. BIOLOGY.—Vegetable Rennet.—Instances of the occurrence of this ferment in the vegetable kingdom 10581

III. CIVIL ENGINEERING.—Foot Bridge over the River Ouse at Bedford.—An arched bridge of 100 feet clearspan, practically without abutments.—The solution of an interesting problem in bridge building.—4 illustrations 10567

IV. ELECTRICITY.—Bell's Water Jet Telephone.—The last development in the line of sensitive and loud speaking telephones fully described and illustrated.—5 illustrations 10574

V. GEOLOGY.—Geology.—By ARCHIBALD GEIKIE, LL.D., F.R.S.—The origin of mountains, and the world's history as contained in the rocks.—Conclusion of this popular treatise.—4 illustrations 10578

VI. MECHANICAL ENGINEERING.—Coal Hoist of the Philadelphia and Reading Railroad.—A hoist capable of coaling 100 engines a day, and of hoisting 60 tons an hour.—1 illustration 10570
Modified Corliss Gear.—A modification due to a Scotch firm described and illustrated.—1 illustration 10563
The Morton Valve Gear.—The gear used on the new engines of the Ohio and since placed on the Circe.—Description of the latter's engines.—6 illustrations 10568

VII. METALLURGY.—The Influence of Aluminum upon Cast Iron.—By W. J. KEEP, C.E.; Prof. C. F. MABERY, S.D.; and L. D. VORCE.—An elaborate investigation of this problem, showing the good results obtained by the use of aluminum in cast iron.—7 illustrations 10575

VIII. METEOROLOGY.—The Maurer Heliograph.—A photographic heliograph for registering the hours of sunshine.—3 illustrations .. 10581

IX. NAVAL ENGINEERING.—On the Comparative Merits of Deep Keel and Center Board Yachts for Racing Purposes.—A discussion of this important point from an English standpoint, giving the scientific view of the subject 10567

X. ORDNANCE AND MILITARY ENGINEERING.—Improved Transport and Pontoon Equipment.—By Lieutenant E. S. COPEMAN.—An advance in pontoon practice, a light form of equipment which can be used also for the transportation of stores, water, etc.—2 illustrations 10571
Krupp's Projectiles and British Steel Faced Plates.—Interesting trial of Cammel's armor plates, how the projectiles affected the general condition of the armor, their penetration and other points.—4 illustrations 10570

XI. PHOTOGRAPHY.—Photographic Notes.—Printing and toning, preparing glass plates for use in the wet process, removing gelatine films from glass blue prints, a series of practical points in photographic work 10573

XII. PHYSICS.—Magnetic Strains.—The behavior of metals in a magnetic field.—1 illustration 10575
Superficial Tension.—The surface tension of liquids illustrated by some experiments in physics without apparatus, the action of oil on waves.—5 illustrations 10577

XIII. TECHNOLOGY.—The Yanyan Concentrator at the Glasgow Exhibition.—A multiple effect sugar liquor concentrator involving the direct action of steam on the cane juice.—2 illustrations 10572

DOES EXCITEMENT SHORTEN LIFE?

Whoever may have studied man's earthly tenure and the causes which tend to lengthen or curtail it, will have scarcely failed to notice how contradictory is the evidence of those we naturally look to to explain them, and that their evidence, even when they agree, does not always accord with what would seem to be the facts, as they appear around us. One authority says general physical development is necessary to prolong life, while another insists this is not required if the day's employment does not call for physical exertion.

Dr. D. B. Richardson, an eminent English authority, whose remarks before the Sanitary Institute of Great Britain on the storage of life we quoted recently, declares, among many obvious though scarcely novel propositions, that everything that quickens the action of the heart, any kind of excitement, taxes and reduces the storage of life.

If this were said of those naturally feeble, or inheriting disease, or even of those leading sedentary lives, and living from day to day without the invigorating benefits of fresh air and exercise, it would seem reasonable, for one does not have to be a skillful physiologist to know that excitement affects the nerves as well as the heart. But is the statement strictly true when referring, as here, to the entire human family? Surely soldiers engaged in actual warfare and sailors in peace as well as war live among excitements, besides being notoriously addicted to indulgences as to drinking and smoking, yet are they long-lived. Statistics show it and observation corroborates them. The pension list of the British army, giving the ages of the beneficiaries, men who have served in all climates for from 20 to 40 years, and excluding those pensioned sooner because of "wounds received while in the performance of duty," shows that soldiers do not die as other men do; so it is with the naval pensioners of the Greenwich Hospital, now scattered over Great Britain, because of its abolishment.

In the merchant service to-day it is no uncommon thing to find a man 70 years old in charge of a vessel—a post requiring activity of body as well as of mind. Here in New York we have the proof near us, for at Sailors' Snug Harbor, on Staten Island, are 800 aged but for the most part hearty sailors. Most of these are between 70 and 80; active old fellows they are, with clear minds and good appetites. They will tell you they are not by any means the sole survivors of our one time merchant fleet; that many, if not most, of their mates are yet living, but distributed over the country, living with their grandchildren, perhaps wherrying for a living or engaged in other employments along a water front. From this it would appear that a sound human body can withstand hunger and exposure and even frequent excitement, if only there is plenty of fresh air and exercise of a vigorous kind thrown in.

ELECTRICAL LIGHTING CONVENTION NOTES.

At the Electrical Lighting Convention, an account of which will be found elsewhere, President Duncan advised the companies to enlarge their plants at the earliest moment in order to enable them to supply power as well as light—a timely suggestion, be it said; indeed, some companies are already doing this, though yet in a small way, for the possibility of obtaining cheap power, like all other economical expedients, has only to be understood by the manufacturers to produce a large and steady demand. We have not, unhappily, yet reached that point where large parcels of power can be transmitted by wire in the form of electrical energy to great distances. But in shops where not more than say five horse power is required—and such shops may be counted by the thousand—the project of electrical transmission is already practicable.

The economy of the plan is immediately obvious. However small the steam engine, an engineer must be employed. Then there is the expense of fuel, the removal of its attendant ashes, not to mention the smoke and dust and grease. Under the transmitting system, a small manufacturer can get what power he requires at far less expense and annoyance, doing away with engine and engineer and getting more or less power, according as his business is brisk or dull. The electric lighting plant is peculiarly fitted for supplying power, because, during the day hours, when power is wanted, it may be devoted exclusively to that end, instead of, as now, lying idle, its great energies of steam engine and dynamos uncalled for. Thus a plant may be turned to double use, supplying power during the day, when light is not required, and light at night, when the workshops are closed.

In the paper on "A Basis from which to Calculate Charges for Electric Motor Service," a pretty broad hint will be found, not only to the vendors of power, but as well to the user. We are told that mill and shop people invariably order and pay for far more horse power than they use, and that though the price per horse power received by the vendor may seem inadequate, in reality he is well insured against loss because the demand for power never comes up to the maximum paid for. Thus, in a shop doing lathe and bench work, the full demand on the shaft would scarcely ever be called out, yet the amount of power seemingly required, and therefore paid for, would be the sum of the demands made by each lathe and roller.

The paper by S. S. Wheeler, expert of the Subway Commission, led to a protracted discussion, during which Mr. Wheeler admitted he could not explain how by any system of connections and distribution a system of underground electric lighting could be made to compare as to economy and efficiency with that now in use. He said the terms it was proposed to charge lighting companies was $1,000 per mile for 3 inch duct, $800 per mile for 2½ in. duct, $750 per mile for 2 in. duct, $550 for 1¼ in. duct.

The president of an electric lighting company asked him if his company had really decided to charge $800 per mile for a year's use of a duct that only cost $500, to which Mr. Wheeler answered that they had.

Several experts, both as to technique and cost, interpolated Mr. Wheeler as to the practicability of burying the lighting wires by means of any of the systems now known, and the discussion that followed was listened to more eagerly than any other that was had during the sitting of the convention.

Facts were pointed out and figures exhibited showing the obstacles in the way; the danger of running high tension currents so near to gas mains, water mains, and telegraph and telephone wires was explained, and the costliness of connecting up, with the amount of precaution necessary, was illustrated. Mr. Wheeler did not answer these, fairly admitting he could not, and could only say that, if his company were given a chance, they would, he believed, after practical experimentation, find a means of accomplishing what was required.

But the expense of these experiments would come out of the lighting companies, and even in the case of failure, and a suspension, by reason of this, of all electric lighting, the subway company would not consider itself liable for the resulting loss, but would only agree not to charge any rent for the time when good service was not rendered. The electrical lighting men objected to the monopoly being given to one subway company, believing the plan left room for exorbitant charges, as had already been seen, and had other objectionable features.

A suggestion that seemed to meet with no little favor was made during this discussion, as a means of avoiding many difficulties now presenting themselves in the problem of burying the lighting mains. It was to reduce high tension currents three-fourths in intensity, thus leaving out the element of danger to human beings, though not to animals.

The Watkin Position Finder.

The Watkin position finder, for which the British government paid $225,000, proved its value recently in some experiments with an old pattern 9 inch muzzle-loading gun, polygrooved and mounted on a carriage admitting of upward of 35 degrees elevation. The position finder, worked by Major Watkin himself, was on a hill 230 feet above the sea level, and about a mile and a half from the battery. The target, which consisted of a raft 100 feet long by 40 feet wide, was sent drifting with the tide, which was running between five and six knots an hour. At ranges extending up to 10,200 yards (or close on six miles) most accurate shooting was obtained, several hits being recorded by observers placed on a tug close to the target, the greater portion of the forty rounds falling close round the object, which could not be seen from the battery.

A Perpetual Railway Pass.

When the Boston and Providence Railroad Company was chartered, Mr. John C. Dodge, of Attleboro, conveyed a portion of his land in consideration that he and his family should ride free over the line as long as the land was used for railway purposes. A granddaughter of Mr. Dodge now claims that she is entitled to the privilege named in the deed, and that the word family meant "descendants" of the grantor. The railway company demurred on the ground that the remedy of the plaintiff is at law, and not in equity. Judge Allen, however, has overruled the demurrer, and expressed an opinion that under the deed the Boston and Providence Railroad Company would be required to carry free the descendants of Mr. Dodge for all time.

English Cotton Spinning.

Owing to the perfection of her spinning machinery and the large amount of capital invested in the business, England spins more woolen and cotton yarn than all the other countries combined, and yarns are among the most important of her exports. The quality of cotton yarn in England is expressed by counts or numbers denoting the number of hanks in a pound, signifying coarseness or fineness. This rule of numbering is very simple, being the number of hanks, each 840 yards long, requisite to form one pound in weight. Thus No. 40 denotes yarns of which forty hanks weigh one pound.—*Dry Goods Chronicle.*

© 1888 SCIENTIFIC AMERICAN, INC.

Convention of the National Electric Light Association.

More than 200 men connected with the electric lighting, motor, and kindred industries met at the Hotel Brunswick, New York, last week, to discuss matters relating to their vocation. The meeting lasted three days: Wednesday, Thursday, and Friday, August 29, 30, and 31; and in attendance and interest it far surpassed any preceding it. In opening, President Duncan said that in February last there were 4,000 isolated electric lighting plants and central stations in the United States, which operated 175,000 arc lights and 1,750,080 incandescence lights. Since then there have been added 1,361 new isolated plants and stations, operating 35,201 arc lights and 392,944 incandescence lights.

A complete record is kept of these, and from it appears that now there are 3,351 plants and stations, operating every night 192,500 arc and 1,925,000 incandescence lights. There are also 459,495 horse power of steam engines devoted to electric lighting. The capital invested in the electric lighting companies during the past half year has been increased to the extent of $42,210,100. In February there were in this country 34 electric railways, with 138 miles of track, operating 223 motor cars, and utilizing 4,180 horse power for stationary engines. 49 new roads are now being built, having a total of 189 miles of track, and to use 244 motor cars. There are also several motor factories, some of them employing as many as 1,200 men. The president advised the lighting companies to reach out and arrange for supplying power as well as light, ere this business was taken out of their hands by separate companies.

Mayor Hewitt, being presented, explained his position in regard to burying the wires. He said that it was absurd to remove the wires from the streets before a practicable means of operating them underground was found, dwelling on the importance of the work they performed and how greatly it would embarrass affairs to render them useless. Some one had found a means of burying low tension current mains, but those of high tension could not yet be disturbed. He would not, even if he had the power, force the companies to sink their wires now. If the convention, after studying the matter, agreed that the time had come, he would act in accordance. There was little danger, he thought, from overhead lighting wires, if proper care was taken, and thought that the public as well as the companies should have inspectors. If the convention could not suggest a practical means of burying the wires, he hoped it would explain how they could be made safe."

In an exhaustive paper on "Overhead and Underground Wires in New York," S. S. Wheeler, electrical expert of the Subway Commission, explained the plan by which it is proposed to bury all the wires. "The question of distribution of electrical currents from the main subway," he said, "had been largely left by the authorities in the city of New York to the preference of the electrical companies. Two systems of distribution are at present actually in use in New York by the Metropolitan Telephone Company. These are known as the house top system of distribution, an example of which may be seen at the corner of 6th Avenue and 55th Street, and the manhole system, at Broadway and Exchange Place. In addition to these there are five modes of distribution which can be readily applied to the subways as constructed in New York, and which will be allowed in cases where they are severally most expedient; to wit, the lamp post, the house front, the house vault, now used in Chicago, the back yard, and the manhole system."

The telegraph and telephone problem is practically solved. It is found necessary to resort to subways in order to get sufficient space for wires, and wires for this service are being drawn into the tubes as fast as the labor can be performed. There are about four thousand miles of telephone and telegraph wire already underground, and twelve thousand miles of cables about to be laid in the fall. It is estimated that the saving in cost of maintenance will be about $100,000 per year, owing to the permanence of the style of work which is possible underground. The problem for laying of electric light mains, he admitted, was not yet "fully developed," and, naturally, none of the companies cares to bear the expense of the first experiment. But after the initiative has been taken, the difficulties will be overcome as they arise, as in the development of all other enterprises, and the undergrounding will become a settled and accepted fact.

A Basis from which to Calculate Charges for Electric Motor Service.

BY H. F. LUFKIN.

There is a general average controlling the use of machinery which it will be safe for electric light and power companies to follow in making their charges for motor service, rather than adopt an arbitrary price per horse power, regardless of the character of service required of the motor. Fully three-fourths of the trouble found in electric motors arises from improper shafting and belting. On all installations in basements and cellars, or where there is the slightest tendency to dampness, raise the motor off the floor on a frame or stand, and build around it on all sides of possible approach a low platform, using glass insulators as standards to support it. Single thread sewing machines, which are lightest running, consume the most power in operating. It is because this kind of machine is used on light work and operated at a higher speed than any other class. At equal speed, the volts consumed in a single thread machine as compared with a shuttle machine are about as 2 to 3. In average commercial use the positions are reversed, and the ratio of volts consumed in the single thread, as compared with the shuttle machine, is about as 5 to 3. To double the speed on a sewing machine requires about 2½ times the power. The author describes the work done and the power supplied in some big workshops. He then concluded that an electric lighting company would make money by presenting the customer (a manufacturer) with 30 small motors, charging him $1 per month per motor for current, rather than let him buy a 2 horse power motor to operate the same machine, with the necessary shafting, at a charge of $18 per month for current, counting 2½ volts per machine. From a 50 light machine you could run not less than 900 sewing machines, or about 18 to the arc lamp. At $1 per month per machine an income of $900 per month would be derived from a 50 light machine, without any lamp expenses, such as carbons, etc. Can we sell current for $1 per month for a small motor driving a sewing machine, and make a profit?

I answer yes. 50 cents per month for small motors driving sewing machines yields a better profit to the company supplying the current than $10 per month per horse power in large motors to drive the same machines, besides the advantage which the small motors possess of keeping the circuit in much better balance, the fluctuations due to the stopping and starting of large motors being at times a serious matter. One electric light company, making a specialty of these small machines, rent the motor and supply the current for $1.25 per month per sewing machine, and report that at this price the motor service pays them a better percentage of profit than their lamps.

Machine shops doing principally lathe work use a larger percentage of their contracted power than shops doing lathe and bench work with the same bands. In no case will the service of the motor exceed 65 per cent or 70 per cent of its contract use; for machine shops, like sewing machine shops, will never average over 75 per cent of the shop capacity for operators the year round. The average, where there is much bench work, will fall as low as 40 per cent.

A paper by S. S. Leonard, of Minneapolis, Minn., on "Petroleum Fuel," was read by the secretary.

The author quoted C. E. Ashcroft, who says:

The calorific power of petroleum, for the purpose of generating steam, and the evaporation of water, is several times greater than that of ordinary coal. The successful use of oil as a fuel has, however, been of very recent date, yet so rapidly has it grown in favor, that to-day it is regarded as a strong competitor of coal for steam generating purposes, or where heat and fire are wanted. It was with a great many knowing winks and nods of the head from the engineers and firemen, who laughed at the idea of making steam by the use of oil, says Mr. Ashcroft, that I attempted the use of petroleum as a fuel. Of course it would not work, and it did not work. Why? Because those who were using it did not want it to, as they were afraid some one would lose his job.

We had seen enough of its workings to satisfy ourselves that we could make it a success, and the result is that to-day we are saving from 20 to 25 per cent on the cost of the fuel and 50 per cent in labor, and these same men who laughed so hard in the start at our attempt to use oil would feel that this world was a poor place to live in were we to return to the use of coal. Its advantages over other fuels are many: it is easier handled, a steadier fire is easily kept up under your boiler, consequently the steam is kept at a more even pressure, a very important thing in the running of electric lights; there is no opening of furnace doors allowing cold air to come in contact with the boilers, and there are no impurities in the oil such as abound in coal.

When through with it, by a simple turn of the wrist your fire is put out and your ash pits are as clean as they were before firing. In less time than it takes to tell it, you can start your fire. It is only rivaled in handling by natural gas, and even then unless we have all the modern appliances for the handling of this gas, it is far easier to manipulate. This is how we use it: The oil is received in tank cars holding from 90 to 125 barrels each (42 gallons to barrel). From these cars it is drawn off through a valve in the bottom of the car to a storage tank or tanks, there being two of them, holding about 320 barrels each; these are placed underground, so that the oil runs from the car into them by gravity.

In the top of each tank are man-holes and a vent pipe. These tanks, boiler shaped, are placed end to end with a space of about 8 feet between; this gives room to get at the various pipes. They are joined together at the bottom by a pipe which also connects with the supply pipe running to the boiler room; in the bottom of each is a drain pipe to allow for cleaning. The burners are fed by gravity. A hotter fire can be had from oil than from coal or wood, and there is absolutely no smoke. In economy of fuel, oil has an advantage, as said before, of from 20 to 25 per cent, and from 40 to 50 per cent in labor. Here are figures from tests recently made by Mr. Leonard: 111·34 H P., running six hours, used 250 gallons oil, costing $5.50, or at the rate of 70 cents per 100 H. P. per hour; 104·8 H. P., running 6 hours, used 3,461 pounds coal, costing $5.45, or at the rate of 86 cents per 100 H. P. per hour. Another test gave the following figures: 96·45 H. P., running 8 hours, used 4,014·75 pounds of coal, costing $6.32, or 80 cents per 100 H. P. per hour; 115·54 H. P., running 7 hours, used 233 gallons of oil, costing $5.05, or 62 cents per 100 H. P. per hour.

In the above figures, oil is from 17 to 32 per cent cheaper than coal. The highest evaporation made with oil was 14·8 lb. water per pound of oil with feed water at 103, and with coal 5·38 lb. of water per pound of coal, feed water at 103. The coal used was a good grade of Illinois lump, costing $3.15 a ton, but usually worth $3.25. In the matter of labor, one man can easily attend from seven to ten 150 H. P. boilers, and then have less to do than firing one boiler with coal.

Chinese Restaurants.

Mr. Wong Chin Foo, an Americanized Chinaman, and a well known journalist of New York, contributes a very interesting article on "The Chinese in New York" to the August number of the *Cosmopolitan*. In speaking of the gastronomic habits of the Chinese, Mr. Wong (the Chinese put the family name first) says that in their restaurants these people do not generally pay by the dishes ordered, but by the tables or spreads, called *gzuh*. A first class spread includes about forty courses, which it takes two days to finish, and which costs fifty dollars. A second class spread, with twenty-eight courses, costs forty dollars. A third class spread, with eighteen courses, costs twenty-five dollars. The cheapest spread includes eight courses, and costs eight dollars. This is the lowest price for which a man can order a formal dinner in a first class Chinese restaurant (of which there are eight in New York City); but then the spread is made for any number of people within twelve. If a person simply wants to eat a short meal for himself and a friend or two, he can get ready made dishes of fish, chicken, ducks, pigs' feet, rice, tea, etc., cheaper than in any other restaurant. The foods are all chopped in small pieces, rendering knives and forks unnecessary. The Chinese table implements are chopsticks of ebony or ivory, a tiny teacup, and a porcelain spoon.

A staple dish for the Chinese gourmand is *chow chop svey*, a mixture of chickens' livers and gizzards, fungi, bamboo buds, pigs' tripe and bean sprouts stewed with spices. The gravy of this is poured into the bowl of rice and makes a delicious seasoning for the favorite grain. The tea is made by pouring hot water over the fresh oolong in a cup, and covering the latter with a smaller saucer to draw. Then, pushing back the saucer a little, the fluid is poured into a smaller cup, and more hot water is added to the grounds. This may be repeated five or six times, and the last cup will be nearly as strong as the first. The Chinaman always takes spirits with his meals, pouring rice whisky into a tiny cup from a pewter pot; but he always drinks moderately, and never apart from meals. When a party of Chinamen sit around a table, one dish of each kind of food is served, and all pick from the same dish with chopsticks. When there are several courses, the earlier dishes are never removed, and, by the time a good dinner has been served, the table is literally buried under dishes.

The walls of the restaurant are hung with long scrolls of Chinese writings—maxims from philosophers for the entertainment of those who eat—and from the ceiling hang large fantastically painted Chinese lanterns, and flower baskets that resemble bird cages.

To the rear is the kitchen, which is always scrupulously clean. The stoves are curiosities. They are long ranges built of thin broad bricks. In the top there are great pits into which are firmly set iron gridirons imported from China. Two of the ranges have open pits only, and there are places where whole hogs are occasionally hung upon iron bars and roasted. Coal is never used in these Chinese kitchens, but only hay or hickory wood.

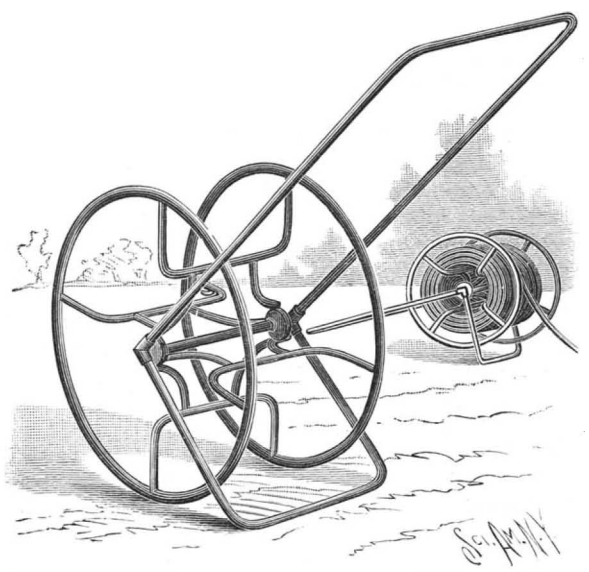
"At least five hundred Americans take their meals regularly in Chinese restaurants, in orthodox Chinese fashion, with chopsticks."

A CORRESPONDENT writing from Johnson, Nebraska, says: Shortly after 8 o'clock P. M., on the 16th of August, a meteorite, large, and of a green color, started a little north of east, and, about 25° above the horizon, fell slowly (apparently) to within about 5° of the horizon and vanished. It was in sight likely 6 or 8 seconds. I suppose it was moving nearly from west to east.

© 1888 SCIENTIFIC AMERICAN, INC.

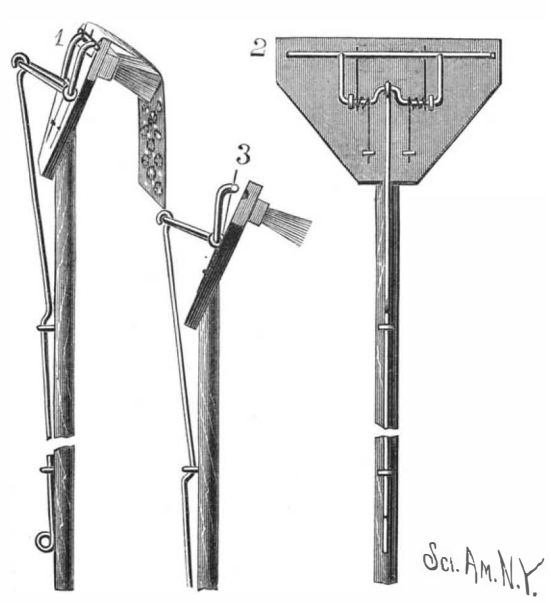
AN ALL-IRON GARDEN HOSE REEL.

A hose reel which is strongly made, of simple and inexpensive construction, and designed to be very durable, has been patented by Mr. Reuben D. Wirt, of Independence, Mo., and is shown herewith, one figure showing the handle and brace in position and the reel raised for reeling up hose, while the other figure shows the position of the handle when the reel is not in use. Its side circular sections, as well as its handle and brace,



WIRT'S HOSE REEL.

are preferably made of light iron pipe, the circular sections, instead of being united by welding or coupling collars, being joined by pins or rivets passing through them and through a filling block. Angular arms unite the circular sections, one of the arms having a cleat on its inner face to fasten the end of the hose. The handle is free to swing or turn over about the axle of the reel, and is connected at its inner ends, as by elbow couplings, with a bent foot brace, arranged to occupy an approximately right-angled position. When the

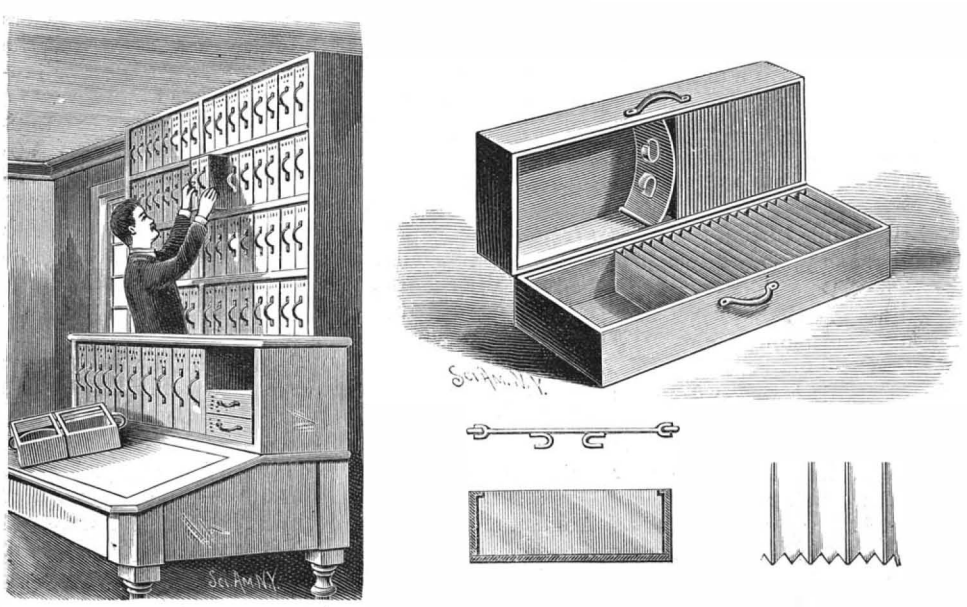


McAFEE'S PAPER HANGING CLAMP.

reel is not in use, the brace rests upon the ground, holding the handle raised and the reel in condition for wheeling away, but to reel up the hose the handle and brace are turned so that both rest upon the ground, and lifting the reel up from the ground.

AN IMPROVED FILE CASE.

A simply constructed case for filing documents that it is desirable should be filed for security, and at the same time be readily accessible at any time, is illustrated herewith, and has been patented by Mr. William F. Altfather, of Weatherford, Texas. The case is made of two or more parts, so united as to allow of their being folded together, thus securing compactness and portability, and the case has extensible pockets, as shown in one of the small figures, to be made of heavy fibrous paper or any suitable material, formed with long folds, and with short folds at the bottom. The upper edges of the cases are made with a lip projecting inward, as shown in the cross section, to retain the pockets in their proper place, and a follower is employed to keep the papers filed so pressed together as to prevent their falling out of the proper compartment. The follower is made of such length that it needs to be slightly bent to place it in proper position, when its ends impinge on the sides of the case and retain it in position against the papers, a strip of rubber being secured on the ends of the follower to insure their engagement with the sides of the case. These cases are designed to be manufactured in different sizes for use in banks and insurance offices, as storage cases for records of county clerks, etc., as well as in business offices of every kind. For such uses they can be made, at a moderate cost, of a good quality of bookbinders' board with cloth corners. These extensible pockets can also be used in the drawers of desks and tables, which can be easily fitted to receive them.



ALTFATHER'S FILE CASE FOR VOUCHERS, DEEDS, BILLS, ETC.

Purification of Yeast.

The *Brewer's Guardian* says that a new method of purifying yeast has been suggested, and that it has already been adopted by some of the Continental manufacturers. The yeast is added to a dilute solution of sugar, and the resulting mixture is subjected to the action of a centrifugal separator. By this means the living cells are effectually divided from the dead cells and the bacteria; the pure yeast leaving the machine in a concentrated condition, while the dead cells and the bacteria remain in the liquid. It is said that the process is so perfect that nothing but healthy cells are to be found in the separated yeast, and that the purified article possesses such remarkable germinating power that a glass which is one-quarter filled with it will overflow in the course of an hour.

A CLAMP TO FACILITATE HANGING WALL PAPER.

A simple device to facilitate the work of hanging wall paper is illustrated herewith, and has been patented by Mr. John F. McAfee, of Pleasant Hill, Mo. On the upper end of the handle is carried a slightly inclined plate, to the inner side of which is fastened a brush. Across the upper end of the back of the plate is a groove into which fits a bar secured to arms of a bell crank lever fulcrumed on the back of the plate, as shown in Figs. 1 and 3. The other arms of the lever are pivotally connected with a rod extending downward along the handle, and having an offset or shoulder adapted to engage a bearing on the handle when the rod is pulled downward. The paper being covered with paste, one end is laid over the upper end of the plate while the clamp bar is in open position, as shown in Fig. 3; the operator then releases the shoulder in the handle rod from its engagement, when the bell crank lever, by the action of a spring, causes the clamping bar to clamp the paper, as shown in Fig. 1. The operator then presses the paper, by means of the clamp and brush, against the wall near the ceiling, disengaging the clamping bar by means of the handle rod, and striking downward with the brush to press the entire length of the paper against the wall.

AN IMPROVED WIRE BOX STRAP.

A box strap made from Bessemer steel wire, of great strength and so made as to admit driving a nail at any desired spot, is shown herewith, in section and as applied to cases of goods. This strap will not cut the hands, is somewhat flattened, and will lie closer to the case than would an ordinary twisted wire strap; a nail may be driven in the last hole of the strap, so that it cannot be bent outward. The strap is formed in a machine capable of turning out 125 feet per minute, cut to the lengths desired, and painted ready for use. It is estimated that box straps of different kinds are used by about 150,000 houses in the United States, and as the cost of wood straps has been steadily advancing, this improved wire strap is designed to meet a growing demand.

For further information relative thereto address Mr. H. Frank, No. 36 Elm Street, New York City.

A WINDOW STAND FOR FLOWERS, ETC.

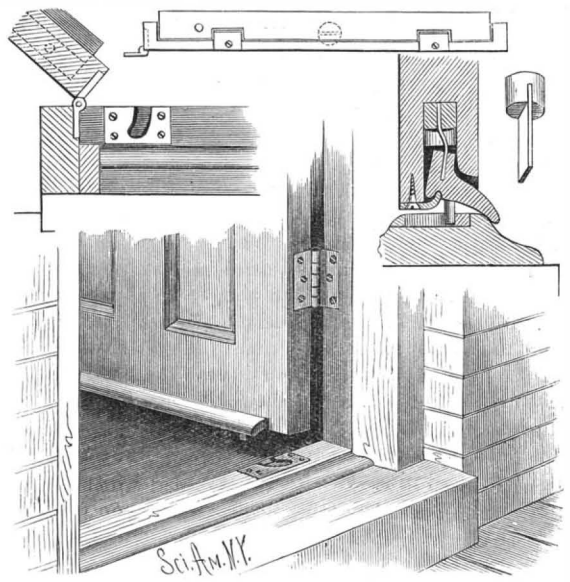
A novel construction of stand for flowers or house plants, designed to set before a window and made to revolve, for more conveniently taking care of the plants, is illustrated herewith, and has been patented by Mr. Herbert L. Starks, of Preston, Conn. The central post about which the shelves revolve is supported by any suitable base, there being a socket piece arranged within a central or eye portion of the bottom shelf, this piece consisting of two sections forming a single ring. The lower section has marginal recesses to receive the inner ends of the arms of the lower shelf, the upper section receiving upwardly diverging braces to carry the second shelf. The top shelf has a base portion supported by and free to turn upon

STARKS' FLOWER STAND.

the top of the post, this base portion being connected with the lower shelf by diagonal brace rods, fastened beneath the lower shelf by nuts, whereby the upper rotating cap piece carries the whole weight of the shelves, the whole series being hung to rotate in a free and level manner upon the top of the post.

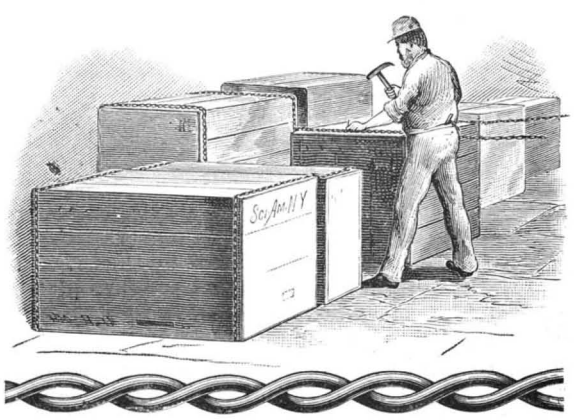
AN IMPROVED WEATHER STRIP.

The accompanying engraving presents a further illustration of the construction and operation of a



REDMAN'S WEATHER STRIP.

weather strip described in our issue of August 11, and which has been patented by Mr. R. C. Redman, of Salem, Oregon. The invention consists principally in an angular strip loosely pivoted in a recess in the bottom of the door, and having a slot in the upper edge of one of its angular portions loosely engaging a depending spring in the recess, its other angular portion projecting outward through a recess in the door, and having a pin adapted to engage an inclined slot in a plate on the threshold.

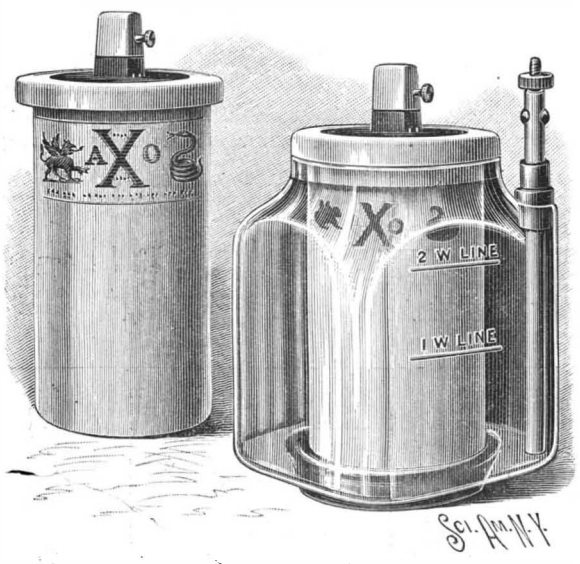


IMPROVED WIRE BOX STRAP.

© 1888 SCIENTIFIC AMERICAN, INC.

AN IMPROVED POROUS CUP BATTERY.

The Axo battery, illustrated herewith, meets and overcomes nearly all the recognized defects in open circuit batteries of the porous cup class. The porous cup has a flange which rests on the rim of the jar and forms of itself a cover for the cell. The zinc passes through an independent aperture of its own in the shoulder of the jar. The carbon conductor has inclined sides, increasing in size from the top to the bottom. By gravitation, therefore, the particles of the surrounding mixture are always in perfect and continuous electrical contact with its surface. The carbon itself is provided with ventilating grooves extending along its sides, by which it is much more readily relieved of the bubbles of gas which form on its surface, and retard the electric action, than by the holes usually run through the seal and into the mixture. The well known lead cap of the carbon is dispensed with, and in its place is used a thimble, with thumbscrew, which can be slipped off and replaced in a moment. The battery wire passes through a small hole in the top of the thimble and into a recess in the carbon, against which it is clamped by the thumbscrew. The jar is square in form, but the bottom is decreased in size, and is round, thus serving three different purposes: to hold the bottom of the porous cell in place, to keep it and the zinc separate at the bottom, and to raise the body of the jar above accumulations of dirt and mould in damp locations. A convenient method of setting up a battery of these cells is to set the bottoms of the jars in corresponding holes in a piece of board. The whole battery can then be taken up and removed without disconnecting the cells from each other.



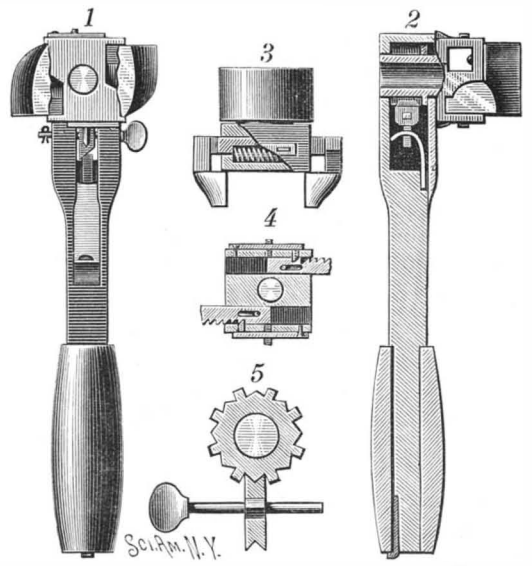
BREWER'S IMPROVED POROUS CUP BATTERY.

This battery, which is covered by no less than six different patents, is put upon the market by the Leclanche Battery Co., the manufacturers of the celebrated Leclanche Gonda batteries.

THE present series of experiments with ordinary live shells and shells charged with melinite and gun cotton against the Resistance, armorclad, have been concluded. The topsides and interior of the hulk are very much torn and rent, but the comparative values of the several explosives will not be determined until after a careful examination of the results has been made on board by a committee of experts. But the mere fact that it was possible to tow the ship into harbor immediately after the firing goes far to prove that the hull was not fatally damaged.

AN IMPROVED WRENCH.

A wrench which can be readily changed to operate as a ratchet wrench or plain wrench, and the jaws of which can be easily adjusted to and released from a nut, has been patented by Mr. Jonathan M. Silvis, of Kittanning, Pa., and is illustrated herewith, Figs. 1 and 2 showing a vertical section, Fig. 3 a plan view and Fig. 4 a horizontal section of the head of the wrench, Fig. 5 being one view of the pawl and ratchet mechanism. Sliding jaws are mounted in a support having a tubular shank, the latter, located in a shank of the handle, and extending across the upper end of a chamber therein, the tubular shank being formed with a ratchet with which a pawl is held in engagement by means of a spring, the pawl being mounted on a rod having an operating thumb screw. The pawl is made with two oppositely beveled sides and two oppositely V-shaped notches, and by rotating a quarter of a turn the rod on which it is mounted, a notched side is brought into engagement with a projection, as shown in Fig. 5, or a beveled side is projected into the path of the ratchet, in the former case locking the ratchet and preventing the wrench from acting as a ratchet wrench, and in the latter case permitting it to so act. The sliding jaws are adjustable on their support for different sized nuts, being automatically moved into extended position. The handle is shown in shortened position, but the construction is such that it can be conveniently lengthened by disengaging a spring and extending the handle on the square end of the shank of the wrench. This wrench is designed to work between bars, or in close quarters, where other forms of wrench cannot be used, and the tubular shank of the jaw support allows the head of the wrench to go over the end of the bolt.



SILVIS' WRENCH.

THE LUCIGEN.

The new system of lighting known as lucigen permits of obtaining an intense light of great brilliancy under very remarkable conditions. This system, which was devised by two English engineers, Messrs. Hannay & Lyle, is based upon the atomizing of combustible liquids by means of a current of compressed air. We shall describe it with sufficient completeness to allow our readers to appreciate the interest of it.

Let us first describe the oil reservoir, which is represented in Fig. 1. The lucigen employs the most diverse oils—crude and rectified petroleum, naphthas, oils of tar, vegetable oils, waste lubricating oil, etc. It can burn all of these, but the luminous intensity varies with the amount of carbon contained in the oil used. It is indispensable that the oil be anhydrous, and that it contain no solid particle large enough to stop up the orifices of the burner.

The oil is poured into the reservoir through the sieve, E, which retains the solid particles, if there are any. It collects in a compartment, F, which communicates with the lower part, D, through a tube provided with a cock shown to the right of the engraving. The compressed air enters through the pipe, A, descends through the tube, B, into the air chamber, C, and causes the oil to ascend in the tube, D, which leads to the burner. The oil reservoir has a double bottom that forms a feed chamber that can be filled during the operation of the system.

Fig. 2 will allow the operation of the burner to be understood. The oil enters the tube, A, under pressure, and makes its exit through a cylindrico-conic ajutage placed within the lamp. This ajutage is capped by a second ajutage, B, serving for the passage of the air and the atomized oil. The air enters through a conduit, C, parallel with the tube that leads the oil, circulates and becomes heated in the worm, D, placed in contact with the flame in the combustion chamber, K, and returns to the annular chamber, E, crowned by the exit ajutage. Here it heats the oil in a certain measure, thus rendering its division easier and surer, and finally seizes it between the two ajutages and carries it to the exterior under the form of extremely small drops. The outflow of oil and air is regulated by a double cock, R (Fig. 3), placed at some distance from the burner.

To complete the description of the burner, it is necessary to mention the role of an accessory oil tube, F, placed at the side and provided with a regulating cock, G (Fig. 2). The oil, on making its exit from this cock, enters a vertical tube, H, that debouches below in the combustion chamber. It here impregnates an asbestos wick, which, during the operation of the lamp, burns constantly, so as to light the burner automatically, in case the flame should become extinguished through any cause.

The apparatus here described is the one constructed and improved by Messrs. Rouart Bros., grantees of the Hannay system for France. It furnishes a broad, thick flame, which might aptly be called a "plume" of fire (Fig. 3, A). The denticulations, observed along the edges of the flame are produced by the shock of the gases in combustion against the surrounding air, which, although carried along in an ascending motion by the ignited, vapor, has an incomparably less velocity.

Messrs. Rouart have devised a series of apparatus designed for the various possible applications of this new mode of lighting. Where the apparatus are to be stationary, the burners are arranged at proper distances upon supports of various heights, according to their

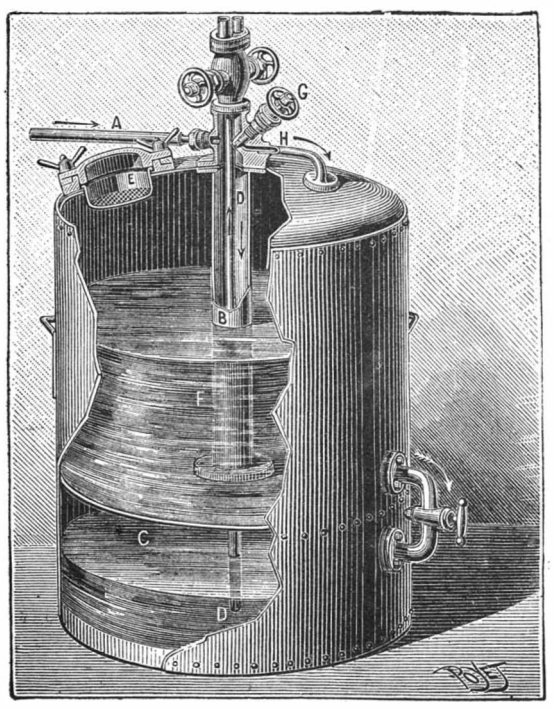


Fig. 1.—OIL RESERVOIR.

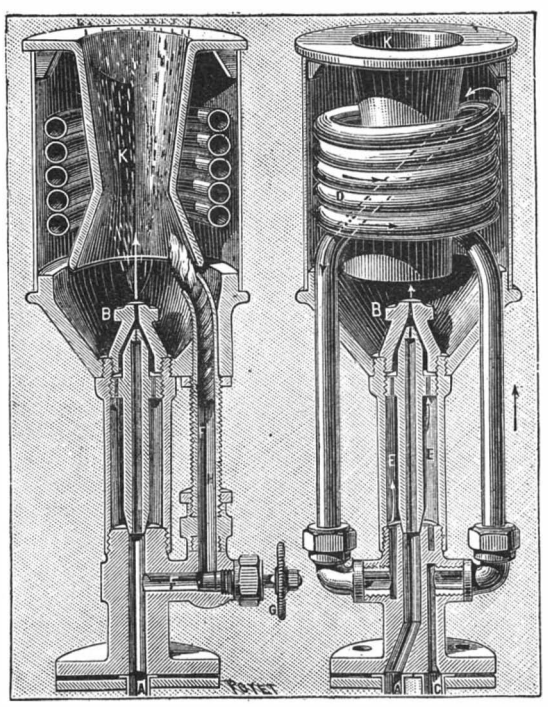


Fig. 2.—DETAILS OF THE BURNER.

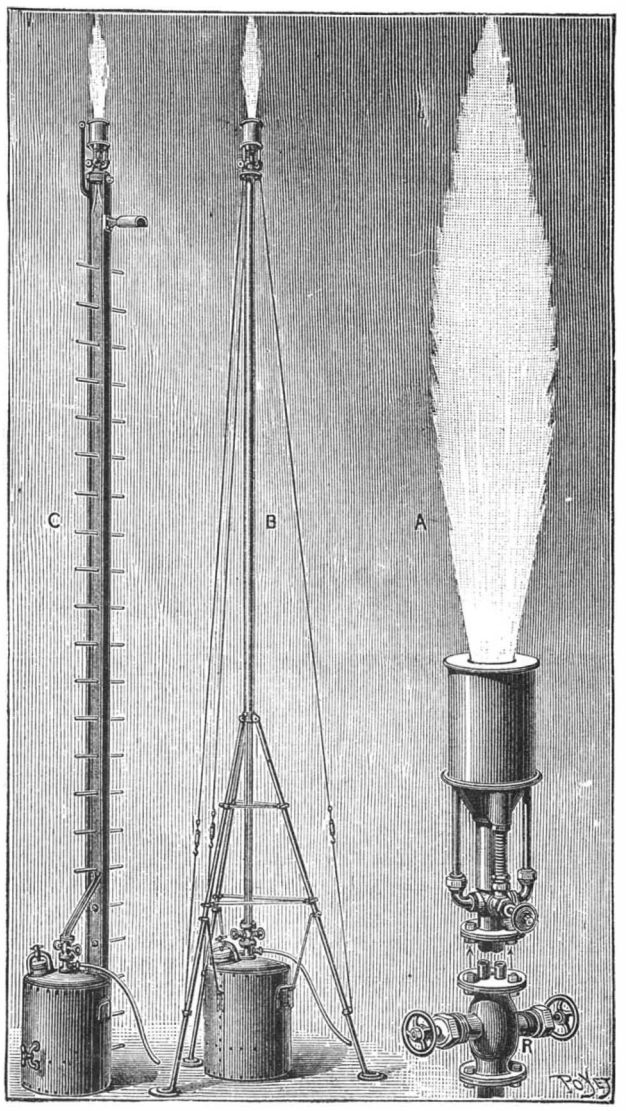


Fig. 3.—A, APPEARANCE OF THE LUCIGEN FLAME. B, MOVABLE SUPPORT. C STATIONARY SUPPORT.

© 1888 SCIENTIFIC AMERICAN, INC.

intensity and the conformation of the ground. Thus, a 2,000 candle burner would, on level ground, be placed at a height of about twenty-five feet. The support used in such a case consists either of a cast iron column or, more simply, of an iron upright provided with rounds so as to form a ladder (Fig. 3, C). It is indispensable, in fact, to be able to reach the burner from time to time in order to clean it, change the asbestos wick, etc. At the base of the support is placed the oil reservoir that we have described.

The regulating cocks of the burner are upon the reservoir, within easy reach, and the lighting is effected, as in the case of gas, by means of a torch. A system of underground pipes leads the compressed air to the different burners. This air is compressed to about one kilogramme by a stationary compressor, which may be operated by a steam, gas, or any other kind of motor.

If a temporary field of work is to be lighted, either a stationary installation like the preceding can be employed, or movable apparatus may be used if the duration of the lighting is not sufficient to permit of so complete an installation. The piping will be simply placed upon the ground, or be buried in a trench not deeper than 4 inches at the most. The supports will be movable and easily carried to the spot to be lighted. For this purpose, these supports (Fig. 3, B) consist of a tripod surmounted by an iron column of small diameter. The legs are hinged so that they can be bent back parallel with the column, thus making the support easily handled. Two men suffice to maneuver it.

One of the most interesting applications of the lucigen apparatus seems to us to be the one that was studied with a view to their application to ambulance cars. A small petroleum motor directly actuates a compressor, and the base of the motor is utilized as a reservoir of compressed air. The supports and the oil reservoirs are those described above. The conduits consist of 30 or 40 tubes twenty feet in length, the mean length of a car. In case of accidents that do not need the presence of an ambulance car, or where there is need of a light that is not to last long (as, for example, in the examination of tunnels), the apparatus differs a little from the preceding. The burner is here fixed directly to its oil reservoir, and the compressor is so arranged as to be operated by manual labor. Two men suffice to supply a 2,000 candle lamp.

The lucigen, which is not yet well known in France, is already in extensive use in England, where it originated, and where it is employed on a large number of railway lines. It serves likewise for lighting important working stations, especially those of the Forth bridge.

With a few modifications, the apparatus may also be employed for heating purposes in a large number of cases. For this purpose, Messrs. Rouart have devised a portable apparatus called the lucigen blowpipe. This consists of a table carrying two burners opposite each other. The oil and air reservoirs are placed beneath the table, and the compression pump with its pulleys is fixed at the side. It therefore suffices to connect this apparatus with any transmission whatever in a shop to obtain immediately two jets of a high temperature, that may be used for soldering, heating rivets, brazing, etc.—*La Nature.*

The Vagaries of the Law.

A decision has been reached in the suit in the United States Circuit Court for the Southern District of New York, entitled Webster Loom Company against E. S. Higgins & Co , of this city, which practically involves the interests of the whole carpet industry of the country. The suit was begun in June, 1874, and is for the infringement of a patent on the wire motion employed in producing the pile of tapestry carpet. The suit in 1878 was decided for the defendants by Judge Wheeler, on the ground that the patent was invalid. Subsequently this decision was reversed by the Supreme Court of the United States, the patent being sustained and E. S. Higgins & Co. being declared infringers. It was then referred to John A. Shields, as master, to ascertain the amount to be recovered by the complainant. The matter has been pending before the master since 1882. The complainant claimed as damages and profits enormous sums, varying from $7,000.000 to $30,000,000, and voluminous testimony was taken from all parts of the United States and England. The master now reports, in an elaborate written opinion, that the complainant has failed to establish any substantial claim, and the decree will be for six cents. The counsel for the complainant were E. N. Dickerson and Edward Stephens; for the defendant, Livingston Gifford and W. K. Griffen.

THE fastest armed cruiser in the world is said to be the German vessel Greif, which has a displacement of 2,000 tons, and is fitted with engines of 5,400 indicated horse power. On the voyage from Kiel to Wilhelmshafen a speed of 23 knots, or almost 27 miles, an hour was obtained. What is the reason our Navy Department does not build some fast vessels like this? Every one of the new ships so far ordered is to be a slow tub compared with the Greif. Why does not the Secretary of the Navy use his influence to have some fast vessels constructed?

Speed of Passenger Trains.

The accompanying table gives the speed of the fastest passenger trains and the average speed of all passenger trains between most of the principal cities of the United States. The times and distances are taken from the *Traveler's Official Guide* for July, 1888. The average distance between the stations at which the fastest train is timed to stop is also given where possible. The time on which the speed is calculated includes all stoppages, and no allowance or deduction is made for ferries, etc. It is believed that in every train given in the table, through cars of some description are run between the termini given, though in some cases no sleepers are run, and in others the sleepers only are run through.

The trains given in the table either run between or pass through 36 of the principal cities in the United States, and it is believed that Denver and Indianapolis are the only important omissions. The case of Brooklyn is of course exceptional. Care has been taken to make the table as accurate and representative as possible, but some errors are unavoidable.—*Railroad Gazette.*

SPEED OF PASSENGER TRAINS BETWEEN PRINCIPAL CITIES, JULY, 1888.

Whence—Whither.	Route.	Fastest Train. Distance. Miles.	Time. Hrs. Min.	Speed. Miles per hour.	Average distance between stopping stations. Miles.	Mo. of trains each way per day.	Average speed of all trains.
New York—Philadelphia	Philadelphia & Reading	90·4	2 9	42·0	12·9	10	32·6
" "	Pennsylvania	90·8	2 5	43·6	22 7	23	34 5
" —Washington	"	226	5 32	40·8	?	9	34 5
" —Pittsburg	"	444	11 30	38·6	89	4	31·6
" —Chicago	"	912	25 0	36 5	102	4	29·9
" "	N. Y. Central & LakeShore	981	25 0	39·1	109	4	32·7
" "	" & Mich. Central	977	28 30	34·3	28·7	3	30 9
" —Buffalo	New York Central	441	10 45	41 0	110	5	34·8
" "	Erie	423	13 0	32·5	21	3	31·3
" "	Lackawanna	409	12 40	32·3	16	2	29·9
" —Boston	Boston & Albany	234	6 0	39·0	33·5	4	35·4
" "	New York & New England	213	6 0	35 5	53	5	31·1
" "	Shore Line	229	6 0	38·2	32·7	4	32 7
Baltimore—Chicago	Baltimore & Ohio	853	25 40	33·2	25	*2	29·5
" "	Pennsylvania	801	23 15	34·4	33	4	28·5
Chicago—Minneapolis	C., M. & St. Paul	420	14 40	28·6	15·0	3	27 0
" "	C. & Northwestern	419	14 33	28·8	18·0	2	27·5
" "	Wisconsin Central	472	15 5	31·3	26·0	2	28·7
" "	C., St. Paul & Kansas City	431	15 0	28·7	22·7	2	26·8
" "	C., Burlington & Northern	442	14 37	30·2	19	2	28·3
" —Kansas City	C., Burlington & Quincy	487	15 40	31·1	24 3	2	26·3
" "	Chicago & Alton	488	15 30	31·5	30·5	3	25 0
" "	C., Rock Island & Pacific	521	16 35	31·5	....	2	27·3
" "	C., Santa Fe & California	458	20 25	22·4	24·1	2	21·7
" —Omaha	C., Burlington & Quincy	508	16 20	31·1	30	3	28·5
" "	C., Milwaukee & St. Paul	490	18 45	26·1	9·4	2	25·0
" "	C., Rock Island & Pacific†	500	16 0	31·2	18·5	3	26·5
" —St. Louis	Chicago & Alton	283	10 35	26·7	?	3	26·1
" "	Wabash	286	9 50	29·1	8	2	28·2
" "	Illinois Central	299	10 30	28 5	?	2	28 0
" —New Orleans	" "	915	35 0	26·1	10	2	25·0
Cincinnati— "	Cin., N. O. & Texas Pacific	826	25 35	32·3	50	2	27·5
Louisville— "	Louisville & Nashville	811	25 0	32·4	25·3	2	29·0
Savannah—Atlanta	Central of Georgia	295	10 20	28·5	10·5	2	28·3
St. Louis—Galveston	Missouri Pacific	1014	46 55	21·4	10·4	1	21·4
" "	Iron Mountain	869	35 55	24·2	13·6	1	24·2
Omaha—Ogden	Union Pacific	1031	36 10	28·5	38	2	24·7
Ogden—San Francisco	Central Pacific	834	37 45	22·9	12	2	21·5
San Francisco—New Orleans	Southern Pacific	2495	113 25	22·0	?	1	22·0
St. Paul—Portland	Northern Pacific	1913	74 20	25·7	31	2	22 8

* Via different routes. † To Council Bluffs Transfer.

The table which will be found herewith contains some interesting information as to speed of passenger trains between the chief cities of the United States. The table has been carefully compiled, so as to represent as fairly as possible all sections of the country, and the rule of selecting as termini important cities indicates fairly the speeds at which passengers are conveyed between the principal centers of business. As it is practically impossible to make any fair allowance for the time lost in stopping at stations, or at level crossings, drawbridges, etc., the time given includes all stops. It is equally impossible to make any allowance for ferries, and the time given is always, as far as possible, that from city to city, and includes the time lost by any ferries, etc., between the terminal points. The average distance between the stopping stations as marked in the time tables is given, and indicates the frequency with which stops are made for traffic purposes. On the great majority of roads many other stops are made for water, grade crossings, drawbridges, and other causes, both permanent and temporary. The Ramsbottom water trough and scoop renders it unnecessary to stop for water, and efficient interlocking signals can be used, which obviate all necessity of stopping at grade crossings. The fact that the famous Jarrett & Palmer special train was run for 439·5 miles without a stop over a road with such numerous curves and heavy grades as the main line of the Pennsylvania shows what can be done in long runs without stopping, and should encourage railroad managers to minimize the time wasted in stopping at points where no money can be earned and where traffic is delayed rather than accommodated.

The table shows very clearly that the train service between New York and Philadelphia stands out preeminent both for speed and frequency of trains, while that between New York and Washington, Boston and Chicago respectively is not far behind. The average speed of all trains between New York and these cities is over 30 miles per hour, which is a higher average rate than obtains elsewhere, and is exceeded only by a few of the fastest trains in the West and South.

The table shows that the fast trains between Chicago and Kansas City, which are said to have been such expensive luxuries, are, after all, run at a very moderate pace, and their speed of 30 to 31·5 miles per hour is exceeded by two Southern roads, one of which has the disadvantage of worse gradients, while neither serves such enterprising Western cities as Omaha, Minneapolis, St. Paul, or Kansas City.

An unwillingness to run a through train at over 30 miles per hour, including a few stops, is a confession of weakness. Going south again, the table shows that a very cheaply constructed road, the Central of Georgia, actually attains a higher average speed between two comparatively small Southern cities than the great competing companies of the West attain between Chicago and Kansas City.

Even when the fastest trains between Chicago and Kansas City are compared with the fastest train between Savannah and Atlanta, the former come out only three miles per hour ahead. The stopping stations are nearly three times as frequent on the Southern road, and an allowance of only three minutes a stop makes the running speed equal.

The train between San Francisco and New Orleans is noticeable for the fact that it has the longest through car service of any line in the world, and in fact it would be impossible to find a continuous line of rail of this length on any other continent. The Canadian Pacific runs through trains from Montreal to Vancouver, 2,906 miles, but we believe sleepers are not run through for the whole distance.

The table shows that east of Chicago the speed of the fastest trains between the largest cities is about 40 miles per hour, including stops, while the average speed of all through trains is about 32 miles per hour. West of Chicago and in the South the speed of the fastest trains is about 30 miles per hour, while the average speed of all through trains is about 27 miles per hour. In the Southwest the speed of the principal through trains is about 23 miles per hour. These figures in all cases include all stoppages.—*Railroad Gazette.*

Fast Trains.

The term high speed is used somewhat indiscriminately, and to most has a very indefinite meaning. If the difficulty of running a train regularly at a high speed is taken to increase approximately as the cube of the speed, a train run at 30 miles per hour requires fully 50 per cent more care, skill, and attention to detail than one run at 25 miles per hour, while the task of running at 40 miles per hour involves fourfold the difficulties experienced in running at 25 miles. These proportions are merely speculative, but they have sufficient basis of fact to render important an increase of a few miles per hour in the speed of a train. The higher the speed, the greater the difficulty of attaining an additional mile per hour.

A LONG trestle has been built by the Portland & Vancouver Railroad to get across the bottom land of the Columbia and reach deep water. The trestle is 8,000 ft. long, with two truss spans across arms of the stream, and extends 700 ft. into the stream. The river is crossed by ferry from the end of the trestle, in about ten minutes.

© 1888 SCIENTIFIC AMERICAN, INC.

THOMPSON'S GRAVITY SYSTEM FOR RAPID TRANSIT IN TOWNS AND CITIES.

A new system of operating passenger railroads in towns and cities, in which the cars are operated by gravity, is shown in our first page illustrations, the distances apart of the stations being approximately such as would be represented by the passenger stations on a city railway. The operative features of such a construction have had numerous illustrations in various switchback railways and coasting tracks at seaside resorts and other places, not to mention the famous switchback road at Mauch Chunk, Penn., which was used for many years to convey coal from the mines to the banks of the Lehigh, and where the inclines are extensive. It has, however, remained for Mr. L. A. Thompson, of Philadelphia, to perfect the working details for the operation of a city railroad on this plan, for which letters patent have been granted to him here and in all the principal countries of the world.

In this new system the locomotive is dispensed with. Hence the railway structure may be very light and simple, offering but little obstruction to the streets. At the stations, it will be observed, there are two undulations in each track, a car approaching the station being carried up and over the slighter elevation of the first undulation, where it stops to discharge and receive passengers, after which it is carried up over the higher undulation beyond, and allowed to proceed on its way to the next station under the action of gravity alone, whereby a high velocity is imparted to the car. Attached under each car is a cable gripping mechanism designed to work automatically, and Figs. 2 and 3 illustrate the manner in which the cables are operated by the engine at the station, and extend out a short distance under the tracks at either side. As the car arrives at the end of each long incline, and without at all checking its speed, its gripping mechanism comes in contact with the moving cable, driven at the station, by which the car is kept continuously on its journey till the desired stopping place is reached, which is on a slight incline, when the cable is released. As the car stands on an incline, it starts of itself by the action of a lever.

The automatic gripping mechanism is shown in plan and section in Figs. 5 and 7, and in Fig. 6 is shown a transverse section of light elevated road construction deemed suitable for this plan of operating a railroad, the metallic supporting columns and cross beams carrying also the track supports (I-beams), adapted to serve as guards on the outside of the car wheels to prevent the cars from being accidentally derailed. The speed which the cars may be expected to attain will depend upon the grades adopted. It is calculated that an average speed of from ten to twelve miles an hour, including stops, can be readily obtained without having the tracks higher than they at present are in many places on the elevated railroads in New York City. Each car will be provided with a suitable brake mechanism to enable the train hands at all times to have complete control of its movement, and there are devices for preventing any retrograde movement of the car while ascending inclines. At each station elevators will lift passengers from the sidewalk to the platforms.

Mr. Thompson has had much experience in building gravity roads. He erected numerous switchback railway coasting tracks in this country prior to 1887, when he went abroad and built a score or more of such roads in England and France, which have proved a great attraction at numerous seaside resorts, watering places, and centers of public resort. Our contemporary, *La Nature*, in describing these railways, recently gave Mr. Thompson due credit as the constructor, but said he was an Englishman. He is, however, a wide-awake, enterprising American.

The Thompson gravity or switchback roads are now in operation in Atlantic City, Lakeside, Gloucester, Paterson, N. J.; Neshaminy Falls, Chestnut Grove, Pa.; Bay Ridge, Md.; Washington, D. C.; Alexandria, Richmond, Va.; Coney Island, Bowery Bay, Oak Point, Saratoga, Rockaway Beach, Rochester, N. Y.; Cheltenham Beach, Chicago; Reeds Lake, Grand Rapids; Coronado Beach, Santa Monica, Cal.; Providence, R. I.

Of the Thompson roads there are also now in operation, in London, three. Of the roadways, in Manchester, two; Newcastle-on-Tyne, one; Blackpool, one; Liverpool, two; Douglas (Isle of Man), two; one in Brighton, Skegness, Great Grimsby, Great Yarmouth, and Folkestone; in Glasgow, two; Hull, one; in Paris, three; Boulogne, one; Barcelona, Spain, one. Millions of passengers have been carried on these gravity roadways, and we believe no serious accident has ever occurred on them. Probably no safer mode of conveyance was ever devised. The form of these roads, as erected by Mr. Thompson, will be seen by reference to the engraving of the roadway built by him at Boulogne, given on page 150.

Mr. Thompson's experience in this line has led him to the elaboration of the method herewith illustrated for street railway service. Among the advantages of this system are the following. There being no traveling engines or motors of any kind, the construction of roadway need cost scarcely half the amount that would be required if engines were employed. All hissing steam, droppings of dirt, hot water, oil, and coal are avoided. The roadway, being light and airy, does not darken the streets, and the cars running almost noiselessly is a feature of no small moment. The cars can be built very much lighter than any now in use on elevated railways, as there is no jerking or sudden stopping. The destruction of power by the application of air brakes at high speed in this system is entirely avoided, and no power is needed to stop. In other words, the force of momentum is utilized, as the car, encountering an incline on approaching the station, ascends by its own force nearly to the top; all the power required to complete the ascent being furnished by the short section of cable at each station, driven by small stationary engines, as shown in our engravings.

The grip is entirely automatic, taking hold of the running cable while the car is in motion (but at reduced speed), and releasing itself automatically at top of incline.

The attendant, by application of a brake, stops the car for passengers to alight or get on. Upon releasing the brake, actuated by a lever movement, the car immediately moves forward of itself, as it stands on a moderately descending grade, and again coming in contact with the moving cable, which carries it over the elevation, and the car then speeds on to the next station. A notable feature of this railway is the construction of the roadbed, its cheapness, and yet efficiency, and absolute safety.

The longitudinal I bars, sustained by straining rods —with cross ties—being of uniform thickness and length, resting on the lower flange of I bars, and held there securely by rods passing through from one I bar to the other, between the ties, the trucks of the car when standing on the rail being so arranged that they cannot get off, the breaking of a wheel or axle could not precipitate a car into the street. Hence its great safety.

Of the practicability and economy of this system there can be no question, as these points have been settled by the numerous examples of such structures now in actual operation. The reduction of this gravity system of propulsion to the local wants of towns and cities for the purposes of rapid transit reflects the highest credit upon the inventive and engineering abilities of Mr. Thompson, and we trust it will not be long before his plans will come into extensive operation. The system is at once effective, safe, and desirable. It is cheaper than steam, horse, or electricity. It furnishes a delightful method of high speed traveling, at low cost, free from many of the dangers and inconveniences of the ordinary steam cars. Further information may be had by addressing the patentee, L. A. Thompson, 914 Walnut Street, Philadelphia, Pa.

Blue Printing.

At the ninth annual meeting of the Ohio Society of Surveyors and Civil Engineers, Joseph N. Bradford, M.E., read a paper on the duplication of drawings, in which he recommended the following formula as giving the best results in the production of blue prints:

No. 1.

Red prussiate of potash	1 oz.
Water	10 "

No. 2.

Citrate of iron and ammonia	3 oz.
Water	10 "
Gum arabic or dextrin	¼ "

Use equal parts of Nos. 1 and 2. Keep these solutions in separate, light-tight, well-stoppered bottles.

The function of the gum arabic or dextrin is to keep the sensitizing solution on the surface of the paper, the quantity used depending upon the quality of the paper—hard, firm paper requiring little; soft, porous paper, more. As the iron and ammonia solution undergoes change when kept, it is better to have the salt in the dry state in a well-stoppered bottle, making the solution as needed.

In preparing the sensitized paper, take a solid, firm paper, free from impurities, and apply the solution to the surface of the paper with a soft sponge or a broad, soft brush, being careful not to have the sponge or brush charged too heavily with the solution, or else the paper will have a streaked appearance, which will show in the finished print. Go over the surface of the paper in two directions at right angles to each other, to insure an even coating. The sensitized paper must be allowed to dry in the dark, and in a horizontal position.

AT a recent meeting of the Paris Academy of Sciences, a paper was read on the thermic conductibility of mercury above 100 degrees C., by M. Alphonse Berget. In continuation of a previous note—*Comptes Rendus*, April 16, 1888—the author gives the results of his studies on the variation in the thermic conductibility of mercury between 100 degrees and 300 degrees C. For 1 degree he finds the variation in the coefficient of thermic conductibility to be —0·00045.

Correspondence.

A Curious Treatment for Hydrophobia.

To the Editor of the Scientific American:

I recently met a gentleman of high educational attainments, who stated that, in six years' residence in the East Indies, he had known of three severe cases of hydrophobia, and that each case was permanently cured. The means used was to take the patient to a pool or stream of water, plunge him in and allow him to just about drown and then resuscitate him. In each case, as before stated, a permanent cure was effected. W. T. G.

San Francisco, Cal., July 16, 1888.

Lightning in City and Country.

To the Editor of the Scientific American:

In answer to inquiry in SCIENTIFIC AMERICAN, August 25, 1888, as to comparative frequency of lightning strokes in cities and open country, a brief account may be found in an article in the *United States Monthly Weather Review*, December 1886, translated from the German, and giving the results of an investigation made by the Royal Prussian Bureau of Statistics. Section 5 of this report says:

"The risk of danger from lightning decreases with increase of number of houses contained in any given district. In Prussia the risk in the country is five times greater than in the city districts. In Berlin the number of fires caused by lightning averages only 0·2 to 0·3 of one per cent. For an ordinary dwelling house which stands among others not particularly high, the erection of a lightning rod is not needed."

It may interest your correspondent T. H. S. and others to know that the same authority gives the statement, based on investigation, that of all trees the oak was most frequently and the beech least frequently struck by lightning. If 1 represents the frequency with which the beech is struck, 15 represents the value for pine trees, 54 for oaks, and other trees collectively 40.

The determination of just where lightning is going to strike depends upon many variable conditions, among which are the geological and geographical features of the locality, the electrification of the cloud mass, the velocity of cloud motion, and the condition of the interjacent air as regards what Sir Wm. Thomson calls its electric strength!

There is no reason why lightning should not "strike twice in the same place," but we can see that it may be of rare occurrence to have a repetition of all the conditions which prevail at the time of a given disruptive discharge. A. M.

New York, N. Y.

Oil on the Waters as a Preventive of Fogs.

To the Editor of the Scientific American:

Can you inform me whether the experiment of pouring oil upon the water of rivers, or ponds, or estuaries, or of the ocean, has ever been made with the object of preventing or removing fogs?

Brand's Dictionary of Science, Literature, and Art, under the head of *Fog*, says:

"Fogs, in general, are the consequence of the nocturnal cooling of the atmosphere. The air, by its rapid cooling, becomes surcharged with moisture; a part of which, being precipitated in the form of a cloud, gives rise to the ordinary fog. During the day the heat of the sun generally disperses the fog, because the quantity of moisture which the air is capable of holding becomes more considerable in proportion as its temperature is increased. In calm weather the surfaces of rivers, lakes, etc., are frequently in the morning covered with fog. The reason is this: During the night the air is cooler than the water; the strata of air in contact with the water are constantly heated, and become saturated with moisture. The mixture of the vapor with the air, together with its elevation of temperature, renders the air specifically lighter. It rises in consequence, and, mixing with the cold air in the superior strata, is cooled, and precipitates its moisture," etc.

It is obvious that the above explanation applies equally to the giving off of visible vapor—the "smoking," as it is commonly called, of hot water when standing in any uncovered open vessel.

Now in this case, as I have found by experiment, though no doubt any practical scientist could have assured me of the result in advance, it needs but a small quantity of oil poured upon the "smoking" water to arrest at once the process of its visible vaporization.

Reasoning from this fact, I should suppose that there might be other uses for pouring oil upon the water than the quieting of the waves. I take it for granted that the fogs most dangerous to navigation are precisely those still fogs due to sudden though slight changes in the relative temperatures of the water and air which are illustrated upon a small scale in the "smoking" of hot water in an open basin, and which can be prevented or stopped by the use of oil.

Again, if oil is effectual to prevent the vaporization of water, why may it not have a possible most valuable use, in river or sea-port settlements, to arrest the spread of malarial diseases, and even of yellow fever?

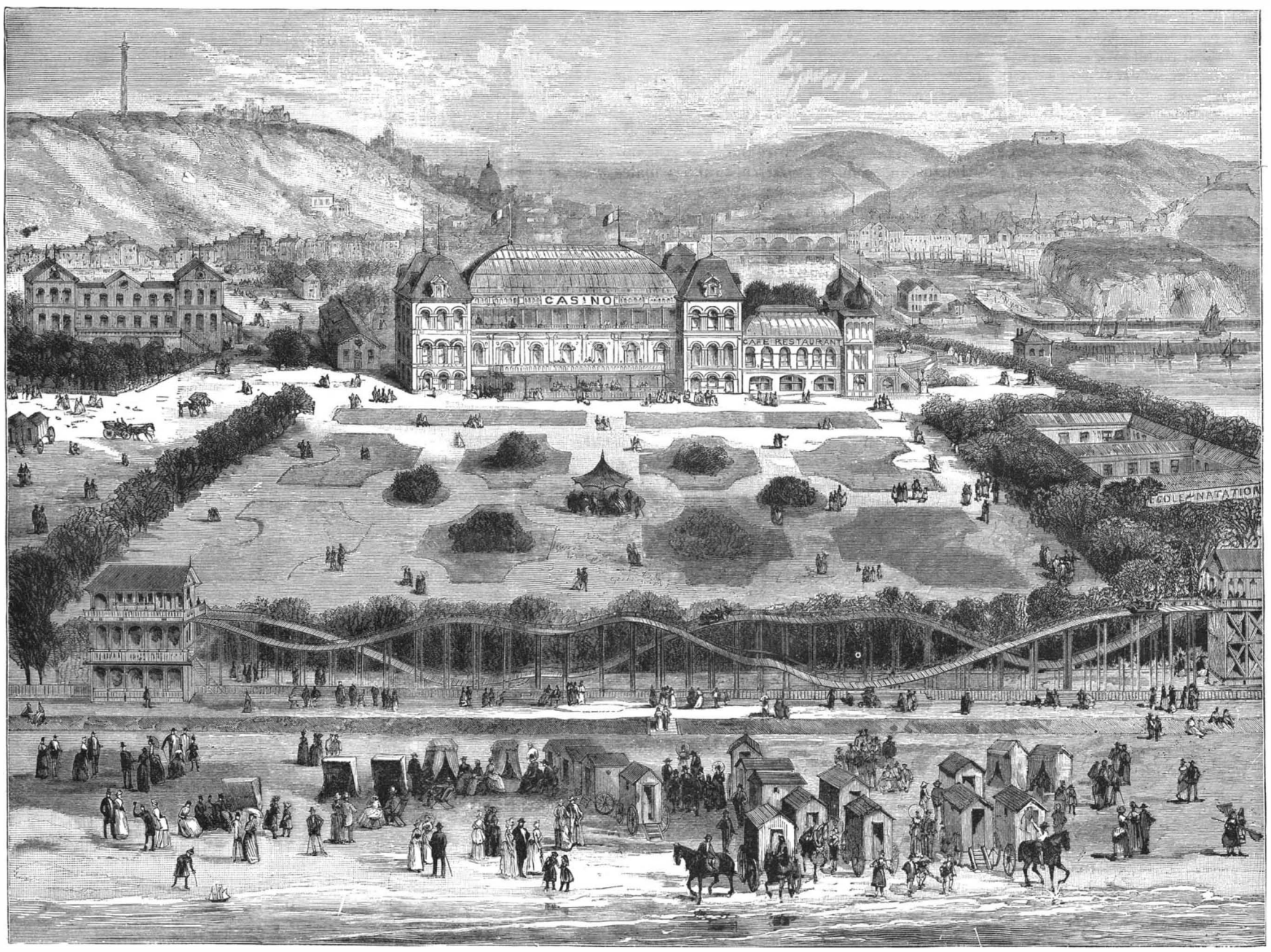
Cambridge, Mass. D. G. H.

© 1888 SCIENTIFIC AMERICAN, INC.

BOULOGNE-SUR-MER.

Our illustration presents a general view of this agreeable and very accessible watering place on the shore of France. A stay in Boulogne is now rendered more attractive by the Grand Casino, in which Mr. Hirschler, the spirited proprietor, has done more in four years than did the previous administrators in forty. At the Casino will be found a newly arranged hydropathic establishment; swimming baths, continually renewed with fresh sea water, and professors to teach the art of swimming; and several hundred bathing machines, the most commodious and best administered in Europe.

On these sands, free from shingle or rock, families can bathe, and children can paddle the livelong day, while the boats of the Humane Society are constant in their attendance for the prevention of accidents. The bathing here is considered healthy and safe at any time of the tide or day, provided that a couple of hours be allowed for digestion; whereas bathing in England finishes at noon or at one o'clock, after which time it is either contrary to the "by-laws" of the town or declared by the faculty to be injurious to health.



THE CASINO, BOULOGNE-SUR-MER, WITH SWITCHBACK RAILWAY, THE TOWN, QUAY, FLOATING DOCK, AND SWIMMING BATHS.

There is no lack of social and intellectual amusement at Boulogne. At the Casino there is a band of sixty musicians, performing twice daily, in the delightful garden. The theatrical entertainments are either comedy, vaudeville, or opera comique by some of the leading Paris artists. There are children's balls and balls for adults at frequent intervals. The ball rooms, theater, and drawing and reading rooms, the restaurant, cafe, and billiard rooms are lighted by electricity, and thousands of fete and illumination lamps in the gardens are furnished in like manner.

A new feature has been added to the Casino; the old skating rink and lawn tennis grounds have been abolished, and in their place have sprung up flower beds, parterres, and shrubberies. A music kiosque has been erected, with a fountain, tents, lounging seats, and tables, and an outdoor cafe service. A continual source of amusement is the switchback railway. It was erected by Mr. L. A. Thompson, of Philadelphia, Pa.

[AMERICAN METEOROLOGICAL JOURNAL.]

Notes on Southern Louisiana.

There are few, if any, portions of the United so wonderfully made as Southern Louisiana from the Gulf coast to latitude 30° 30'. It is a section of country where the highest temperature has never exceeded 97°, and the lowest rarely falling below 20° Fah. Warm southerly breezes prevail almost during the entire year, carrying with them the scent of the tropics, making the nights delightfully cool during the long summers.

It has an average humidity, 72 per cent, summer and winter, and though to the Northerner the heat at 90° may seem greater than it really is, yet from a personal experience there is not that oppressive heat felt here on the hottest days that is felt in the Northern and interior portions of the United States.

Thunderstorms are not a rarity in this section, but there are fewer than further inland. The electrical displays are a marvel during a heavy thunderstorm, resembling more the presence of a body of artillery than anything else; the bolts flashing past trees and house tops in a manner to put to fright a person of but average courage, and a wonder that such a zigzag of fire can keep up for hours without apparent damage fills the thoughts of the beholder. Of rain in such heavy storms the heaviest that I have seen was four inches in about two hours.

The average annual rainfall is about fifty-six inches, equally divided between the months, making the monthly average four and two-thirds inches, and proving that the heavy rains are not a frequent occurrence.

The clear days, entirely free from clouds, will not average a third; but the fair days are in excess. The heavy cumulus clouds are seen in magnificence nearly every evening, and are dispelled toward dusk by the winds blowing from the Gulf.

Of the prominent lakes, Pontchartrain, Maurepas, Borgne, Washa, Grand, White, Calcasieu, and Sabine, the former and Calcasieu are probably those most used by residents as resorts. From New Orleans to Pontchartrain is six miles by rail, where the population of the city go by the thousands each evening and listen to the music of a superb band, and go bathing or sailing. The waters of this lake are connected with the Gulf by the narrow Rigoletts at the eastern end of the lake.

Probably the most beautiful spot in Southern Louisiana is in the vicinity of Morgan City. This city is situated on Tiger Island, and is surrounded by Grand Lake, Flat Lake, Lake Poularde, Bayou Bœuf, and the Atchafalaya River.

Morgan City is beautifully laid out, with wide streets, hard and white, that shed water rapidly. The streets are planted with oak and myrtle trees and the rich umbrella china tree. The railroad cuts the town in two parts. A great deal of lumber is shipped from this city to Texas, and the shipment of opened oysters in cans to the same State last year amounted to 21,000,000 oysters. From three to five tons of catfish are shipped annually to the West from this point, and are caught by line in the surrounding lakes. The hunting and trapping is a sure means of livelihood in this section, also alligator, otter, seagull, and other skins, and the plumage of white cranes, the latter now nearly as scarce as the buffalo on the great Western plains. The feathers of the white crane of particular value will not number more than fifteen or twenty on each bird. They are a slenderly delicate aigrette plume, so white and airy that if held to the sun they are scarcely visible. These feathers are worth $400 per pound in the city market, and I am informed that one man shipped two hundred pounds to France during last year.

A ride in the bayou boats is a novelty to the stranger unlike that experienced elsewhere. They have a distinct motion peculiar to themselves, more like the rocking of a cradle than anything else. Slipping through the drawbridge on one of these boats, lake after lake and bayou after bayou presents itself in this lovely island country, the parish (St. Mary's) being scarcely more than a continuation of these wooded islands; passing pontoon bridges (each plantation has one), which seem to float like cobwebs across the stream. A planter owns both sides of these streams. Consequently the necessity of having a bridge for his cattle and teams to cross to cultivate the land on either side.

The trees on the Teche are the cypress and oak, moss covered and aged. Plantation after plantation was passed; rich fields of cane, orchards of melons and oranges, and the shading fig trees; arbors heavy with the finest of wine-producing grapes; pomegranates, plum, and peach trees furnished the shade. Out on the flat lands mushrooms grow plentifully, and watercressss are tangled over the clear streams. In the gardens are all kinds of vegetables, and about the houses the fragrance of the rarest of flowers, blooming in wild profusion. In the magnolia trees mocking birds were singing, and in the timber, the home of the deer and the haunt of the delicate bird, the hunter was seen ready for his next shot.

R. E. KERKAM.

THE new battle ship Sans Pareil, 15, 10,470 tons, 12,000 horse power, has been built by the Thames Iron Works Company. The Sans Pareil will be completed for sea at Chatham Dockyard. She will carry two 110 ton guns, one 10 in. gun, twelve 6 in. guns, twenty-one 3 pounder and 6 pounder quick-firing guns, a number of machine guns, and 18 Whitehead torpedoes.

© 1888 SCIENTIFIC AMERICAN, INC.

THE TERMITE PEST OF THE OLD WORLD.

JOHN R. CORYELL.

The ravages of the so-called white ant, but more properly designated termite, can hardly be comprehended by those who have not seen the results of its labors. These are so disproportionate to the size and apparent powers of the insect, that no one can be blamed for doubting, except upon the most positive evidence. It is for this reason, probably, that British officials, in termite-infested parts of the globe, have been moved to send to the home government specimens of what the little insect can do. At the South Kensington Museum of Natural History there are two notable examples of the destructive powers of the termite. One of these is the remains of a heavy, square lintel of teak wood, taken from the door of one of the government offices at Jamestown, St. Helena. The other is a piece of sheet lead, from Madras, which has been perforated by the insect. The latter is an extreme case, but the former is not a fair example of average destruction, although it gives a clear idea of what the insect is capable of. In this case the wood has been completely eaten away to the heart, leaving that like a skeleton.

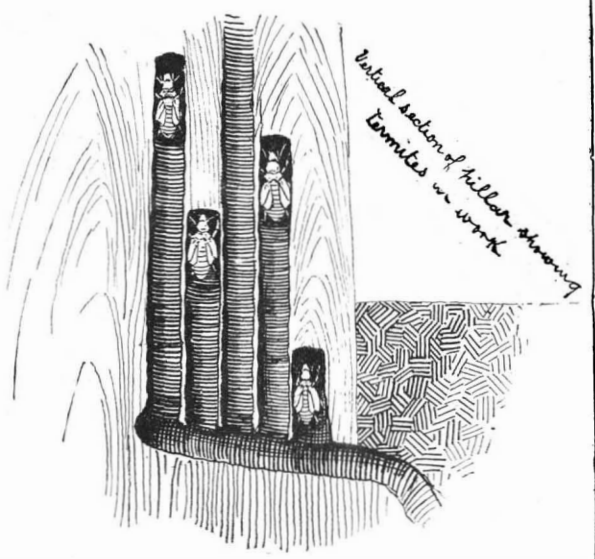
In many cases not even the skeleton is left. I remember once, in the south of China, having occasion to move a huge hardwood chest filled with records, in the shape of books. I called two men to come and lift the chest. They took it by its iron handles, and with one accord bent to it and lifted. It was like a signal for dissolution. It seemed as if force of habit alone could have held the handles in their places, for the instant they were tugged at they came away, and the chest crumbled and fell to the floor a heap of dust and irregular, thread-like shreds of wood. The books then, on being examined, proved to have suffered in the same fashion. Some of them crumbled on being taken up, and others remained so thoroughly riddled with holes as to be nothing better than a fragile lacework of paper.

If the insect destroyed only at times during its varied existence, it might be possible to guard against it better; but when it is considered that as larva, pupa, and perfect insect it is alike and equally destructive, it will be understood what a pest it must be. Camphor is a shield against it, and camphor-wood chests are therefore used for keeping valuable articles in, but even the genuine camphor wood is not always strong enough to keep away the ravenous thing, and it has to be re-enforced by plentiful supplies of the gum.

My first accquaintance with the insect was made one night in the fall of the year, at Canton, while dining with a merchant there. It was still warm enough to need the windows to be wide open and to have the huge fan or punka swinging steadily over the table. We were about half through with the soup when there came in through the windows such a swarm of the termites as soon filled every soup plate and every glass. They fell upon the table like hail, their wings, which they seemed to be losing, floating through the room and finding their way to our most unwilling mouths, in spite of every effort to avoid them. The windows were shut and the table cleared, and we went on with our meal, sweltering in order that we might eat.

These termites, which so bothered us, were the males and females out on their courting tour, and well it is that they were so easily destroyed; for if more than the very smallest percentage of the females were to live, the whole world would hardly be large enough to contain their progeny. One female will lay in the neighborhood of thirty-one millions of eggs in the course of a year. Of these eggs the smallest proportion are males and perfect females, the others being workers and soldiers, and the workers being in an excessive majority. These latter, neuter, classes are not produced, as with so many other insects, by special feeding or treatment, but are determined in the egg.

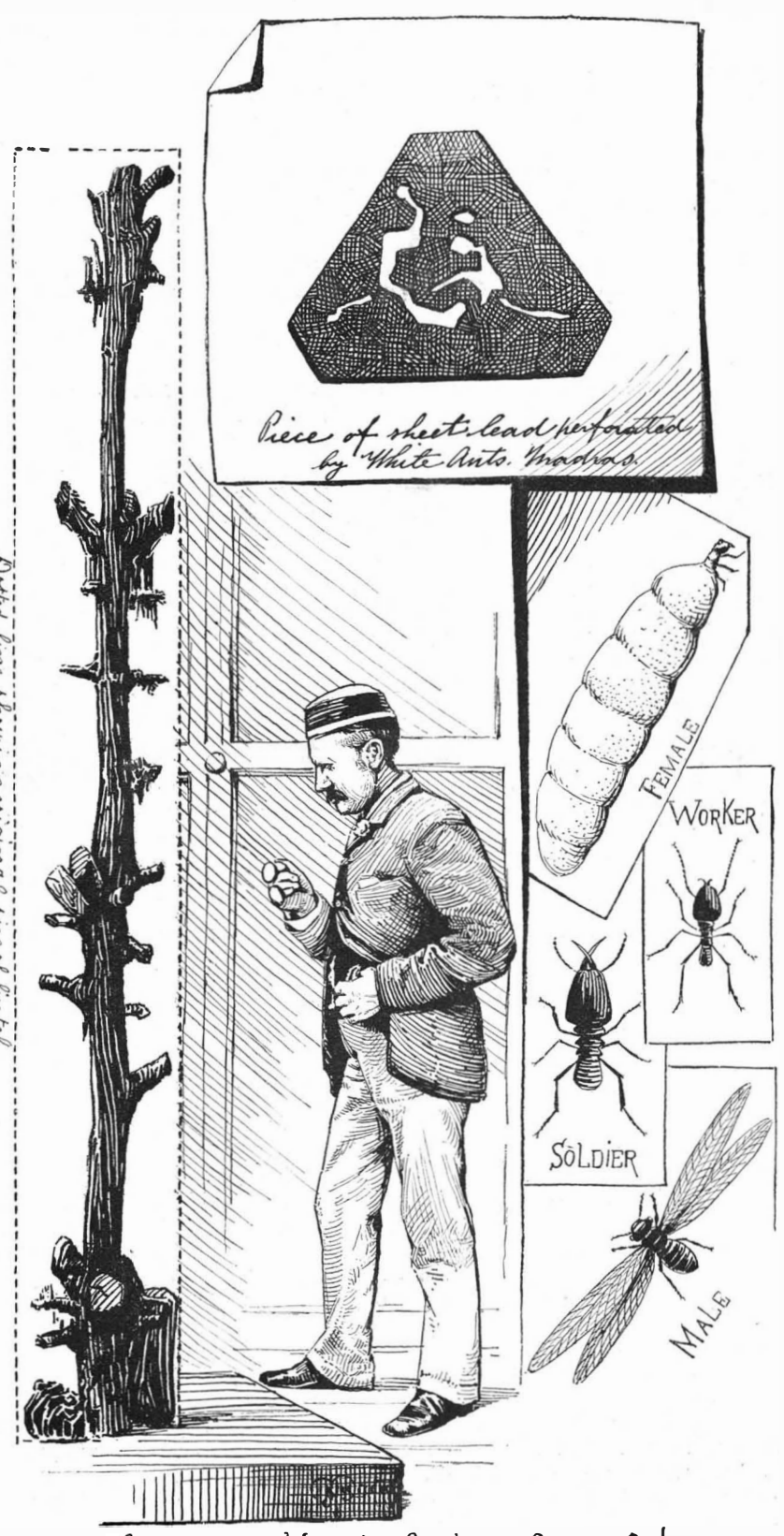
It has been stated that the female is impregnated during the flight, but this is not so. The insects merely pair at this time, and then such as are not destroyed are taken in charge by some workers who have a nest, but no queen, and are conveyed to a cell of unusual size and there practically imprisoned. A hole only large enough for a worker to pass in and out of is left, and then the female is impregnated. She lays the eggs, at the rate of eighty thousand a day, and as they are laid the workers come along and take them to the cells to which they are assigned. The metamorphosis of the termite is not as strongly marked as with so many insects, the larva and pupa differing but little from the



final form which it is to take. The males and females are the only ones having wings, of which the number is four, and these wings are lost as soon as their purpose is accomplished. Of course the reason for the nuptial flight, or more properly the courtship flight, is a sound one. If the males and females were not enabled to leave the nest in this way, there would be the greatest danger of inbreeding, with all its disastrous effects on the termite family.

Perhaps the most extraordinary feature of the female termite is the manner in which she is fitted to perform her duty in life. This duty being solely to lay a sufficient number of eggs to prevent the possible extermination of the insect, she is so constructed that, having gone safely through the hazardous period of courtship, she is spared the necessity of having ever again to resort to it. She holds within her body, when pregnant, all the eggs she is ever going to lay. And as thirty-one millions are a great many and form a vast bulk, comparatively, even of the tiniest things, it follows that she must have some extraordinary means of providing for their reception. And she has. Before impregnation she is not much over half an inch in length, but when ready to begin to lay she has increased so enormously in size that she weighs one thousand times as much as when she took her flight.

There are several species of the termite, some of which make those great tent-shaped mounds of which travelers tell so much, and others building high up in trees. The sort which is so destructive to wood and books makes its home underground, and approaches the object it intends to convert into food by tunneling to it. By this means it renders any attempt to watch for its coming null. Usually it follows the grain of the wood in its progress, but this is not always the case, the direction being determined by expediency. A chest which has not been totally destroyed will show that the insect has gone back and forth and up and down, just as the nature of the wood or its thickness renders the most expedient. Frequently the termite will perform a most singular work in the effort to make the best use of any wooden structure into which it has made its way. If, for example, it has bored through the length of a pillar supporting a house, and finds at the top that there is wood which it would like for food, it first uses up the wood of the pillar and then fills the hollow shell thus created with mud packed until it is as hard as concrete. The pillars of one house taken down for rebuilding in St. Helena were found to be mere shells of wood, compactly filled, except for a tunnel through the length, with a pillar of hard mortar. The skill with which the termite conceals its ravages, and the manner in which it guards against the premature destruction of its means of approach to its food supplies, indicate a high degree of intelligence.



Remains of a square Lintel of a door of one of the government offices at Jamestown St Helena.

Castner's Process for Aluminum and Sodium.

There is no difference of opinion as to the great variety of uses to which aluminum might be applied if it could be produced in sufficient quantities at a reasonable cost. Hitherto it has been produced almost entirely in France by the Deville process; and this process involves so considerable an expenditure that the results have been by no means satisfactory. About seven years ago, Mr. H. Y. Castner, of New York, began experiments in that city with a view to improve the Deville process and cheapen the cost of aluminum by reducing the cost of producing the sodium from which it is obtained. Two years since, Mr. Castner erected experimental works at Lambeth, where he succeeded, after nearly eighteen months of further experimentation, in satisfying a number of men of science and others that he could produce sodium at one-fifth and aluminum at one-third of the cost previously incurred. A company was thereupon formed in order to take up and work the Castner patents.

In October last the foundation stone was laid of new works at Oldbury, near Birmingham, for the production of both sodium and aluminum on a large commercial scale. The works were virtually completed and the successful manufacture of these products was begun about a fortnight ago, and a large number of gentlemen were invited to visit the works on July 28 last and witness the processes in actual operation. Among those who accepted the invitation to be present were the Right Hon. A. J. Balfour, M.P., a trustee for the debenture holders; Sir Frederick Abel, C.B., F.R.S.; Sir Henry Roscoe, M.P., F.R.S.; Lieut.-General Sir Andrew Clarke, G.C.M.G., C.B.; Prof. C. Roberts-Austen, F.R.S., of the Mint; Prof. Dewar, F.R.S.; Dr. Crookes, F.R.S.; Dr. Hugo Muller, F.R.S.; Lord Rayleigh, F.R.S.; Prof. Huntingdon, and others.

According to the London *Times*, only one opinion was expressed by the gentlemen who visited the works—some of them among the highest authorities on the subject—as to the practical success of all the operations witnessed, and the admirable arrangement of the plant employed. Mr. Castner was freely complimented on the skill and success with which he had developed his system.—*Nature.*

© 1888 SCIENTIFIC AMERICAN, INC.

"Dairy" Butter.

In a dark and dingy-looking cellar, belonging to one of the large produce commission houses on the west side down town, two men were busily employed, a short time ago, in "fixing" numerous tubs of butter for the retail trade. A *Herald* reporter watched the operation with interest. The house in question does a large retail trade up town, and the mode of "fixing" these tubs preparatory to leaving the down town establishment may perhaps explain why it is that the up-town consumer pays thirty-five cents a pound for "gilt edge creamery" while the market quotation for the same is but twenty cents.

After viewing the operation for some time and asking a number of questions, the reporter elicited the following facts, which may be said to apply not only to this house alone, but to most of the wholesale houses connected with the trade. John Smith, of Butterville, Ohio, for instance, will consign a number of tubs of butter to a New York house to be sold on commission. The butter is ordinary dairy butter—any sort of butter for that matter—and the market price the day the butter is received is, say, eighteen cents. As this lot happens to be dairy butter, Mr. Smith, of Ohio, is credited on the books of the concern with the sale of so many pounds of butter at the ruling market rate.

Now comes the transformation scene. All the marks on the tubs are carefully scraped off and the butter weighed. Say the first tub weighs sixty-five pounds net—that is, with due allowance made for the weight of tub, etc. The top is then knocked off and the butter "tried" to see what sort of a "brand" it will stand. Then as much salt or brine as the tub will possibly hold is packed on top of the butter. This is the first step. A new top is then nailed on, this cover, by the way, having been soaked and being therefore much heavier than the first one, and the tub is now ready for marking or branding. Here are a few imaginary brands for which stencils have been prepared: "Silver Stream Creamery," "Rocky Spring Creamery, warranted gilt edge," "Fine Mountain Brook Dairy," and so on. Now comes the weighing process. The tub thus metamorphosed, with the addition of several pounds of salt and as many nails as can safely be driven in, is found to weigh seventy-three pounds. Its original weight was sixty-five pounds. This seventy-three pounds of "Silver Stream Creamery" then is sold for say twenty-two cents, yielding a net profit to the "commission house" of $4.36, which, on one tub of butter alone, may be considered a handsome profit.

Sometimes the housewife who buys this "Silver Stream Creamery" at thirty-five cents per pound raises a complaint at the quality of the butter. The reply usually is: "Well, madam, this is genuine 'Silver Stream Creamery,' and it certainly ought to be good," and then madam goes away with the reflection that "perhaps it was the weather after all." Madam might have another idea on the subject if she but knew that most of these flowery named creameries had an existence only in dark and dingy cellars down town.

The Canvasser.

The following from the *Sewing Machine Journal* applies not only to canvassers, but to all salesmen and mercantile representatives:

Many dealers who have recently come into the sewing machine trade, and, while intending to push their business by means of canvassers, are looking around them for the proper material wherewith to organize a good and effective corps, have, in their lack of experience in the business, requested us to give them a few hints that might enable them to make their selections. No department of an office doing a large local retail trade is so important as the canvassing department. It is the basis upon which the entire structure of the business is built. Without it there would be little or no need of collectors, shipping clerks, and horses and wagons, and the duties of the bookkeeper would be remarkably light; while the proprietor himself would be apt to find time hang rather heavy on his hands, though the cash did not feel very heavy in his pockets. In making his selections, therefore, for this all-important branch of the business, he cannot be too circumspect and careful; for, while a good and active set of men will build up his trade in a very short time, on the other hand, a bad and lazy lot will do it incalculable damage in a much shorter time.

If possible, it is better to secure the services of men who have had experience in sewing machine canvassing, on account of their knowledge of the best methods of showing up machines and inducing people to buy them; but experience is by no means absolutely necessary, and it is much better to have the rawest and greenest hand possible out of work, if he is honest and industrious, than an unscrupulous old practitioner who has become an adept in the devious ways and tricks which the canvassing fraternity have the reputation of being thoroughly versed in. But all canvassers, green or not green, should possess these fundamental qualifications:

In personal appearance, since they come constantly in the presence of ladies, they should be neat—a woman instinctively feels a repugnance to a shabby, untidy man. They should be free from offensive personal habits and not redolent of stale tobacco. Sobriety is a *sine qua non*. Unremitting industry is an essential; without it no sewing machine canvasser can be even moderately successful. He must work constantly, day by day, otherwise his efforts will be barren of results, and his position cannot be too soon given to some man who is more thoroughly in earnest at the business.

Canvassers must have a thorough knowledge of the machine they are selling, the operation and uses of the several portions of its mechanism, and the ability to operate it well on every class of work that it is capable of doing. No man should be allowed to go out until he has learned this thoroughly.

In addition to this, canvassers should be instructed to be guarded in their promises to customers, and not let their anxiety to sell machines lead them into raising in the minds of buyers expectations that their employers will disappoint.

They should also be required to say as little as possible about their rivals and their rivals' machines, but to give their whole time and energies to showing up the excellence of their own.

Canvassers who have been for years in the business, who have lived well, supported families, and made money, owe their success to a strict adherence to these few and simple rules; and a force of men organized upon such a basis cannot fail of doing satisfactory work if they have a good machine to sell upon reasonable terms. And it is always an encouraging example to canvassers to know that many who have worked faithfully as such have reached the best paid and most responsible positions in the business, while numbers have been enabled in time to do a profitable business on their own account.

Monte-Christi.

Mr. Thomas Simpson, U. S. consul at Puerto Plata, San Domingo, reports as follows to the State Department:

The town of Monte-Christi * was founded about three centuries ago, and was of some importance in the remote past, but from various inimical causes had dwindled into insignificance, when, in 1872, Mr. Juan Ysedro Jimenes, to whom its revival is directly due, established himself here. Prior to that date there was no business done here worth noting, but Mr. Jimenes soon commenced exporting mahogany, of which wood vast quantities were annually shipped hence until 1876, when, the source of supply being practically exhausted, the exportation of dye woods was begun and still continues with activity.

In the opening months of 1885 the firm of J. Y. Jimenes & Co. successfully achieved, at a considerable cost, the realization of a feat of practical engineering which has proved of inestimable public benefit in many ways. Pursuant to plans drawn by Mr. P. Smith, an American engineer, who supervised and carried the undertaking to a successful ending, a branch of the river Yague was caused, by means of a canal excavated at the proper point, to return to and flow through a former channel (from which it had been diverted by natural causes many years ago), discharging into the sea near Monte-Christi. By thus regulating and confining the course of this stream, hitherto dispersed in innumerable lesser water ways and lagoons, large tracts of land formerly submerged have been drained. These lands are thickly covered with virgin forests of logwood of superior quality, which, before unapproachable, hence valueless, are now being felled and exported. The canalization of this branch of the great river of the Cibao has thus doubly benefited the dwellers in this region, affording unstinted water supply to the formerly waterless town of Monte-Christi, and imparting new vigor and prosperity to trade and to the community in general, by the redoubled activity in its chief staple of export.

Monte-Christi, at the present day, is a town of about 1,500 inhabitants, and its population continues to grow with its ever-increasing commercial importance.

THE largest passenger terminus in London, Liverpool street, is to be enlarged, at a cost, for land alone, of $3,250,000. The extension will enable the number of trains to be increased from the present figure, 700, to about 1,000 daily. The suburban trains will be run faster, and it is believed that the increase in suburban passenger traffic will fully pay the interest on the capital outlay. The increased passenger receipts during the last ten years were $2,500,000, a large portion of which was due to workmen taken advantage of cheap tickets sold in packets at a reduced rate, and living in the suburbs and traveling to and fro every day to work in the city.

* Monte-Christi is situated on the north side of the island of San Domingo, about 60 miles west of Puerto Plata, and near the boundary line separating this republic from that of Hayti. Weekly mail communication is maintained with this post by small coasting schooners, which make the trip in from eight to ten hours, and monthly by the Clyde line of steamers, which occupy about five hours in the passage. On rare occasions mails are sent by land, but as the country is very mountainous and roads bad, this mode of communication is seldom resorted to.

How Artificial Flavors are Made.

In the wonderful laboratory of the growing plant, by processes of which we know almost nothing, the atoms of carbon, hydrogen, oxygen, and nitrogen are made to group themselves into compounds which give to our vegetables and fruits the delicious flavors characteristic of them. In most cases, this flavoring principle is so small in quantity, and so complex in its nature, that the chemist is unable to satisfactorily determine its composition, and it is probable that few of the natural flavors are simple chemical substances, but rather mixtures of different organic salts, ethers, and alcohols.

The flavoring principle of the majority of fruits can be directly extracted and preserved by simple means, forming extracts for flavoring food which are as unobjectionable as they are agreeable. Unfortunately, it happens, however, that many of these flavors can be imitated by various chemicals, which, while they are much cheaper than the natural product, are unwholesome and even dangerous. As a general thing, the artificial flavors are much coarser and ranker than the natural ones, and lack entirely the peculiar fruity taste distinctive of the latter. The greater part of the artificial essences belong to the class of compounds known as ethers, or, more strictly speaking, salts of an organic acid and base.

The artificial essence pineapple, for instance, is composed of ethyl butyrate, or a combination of butyric acid (the acid of rancid butter) and a radical known as ethyl (C_2H_5), which is also present in common alcohol. By combining the ethyl with pelargonic acid, we obtain an ether with a flavor resembling that of the quince. Ethyl caprate is sometimes known as œnanthic ether, and is one of the flavoring substances found in old wine. Another radical, amyl (C_5H_{12}), is also the base of several artificial flavors. Amyl alcohol $C_5H_{11}—O—H$ is the poisonous fusel oil found in the poorer grades of whisky. Amyl acetate forms the well known essence of Jargonelle pear, while amyl valerianate is a very good imitation of the flavoring matter of the apple. Amyl caprate is found in Hungarian wine.

The natural flavors of the peach, plum, almond, etc., are due to nitrogenous bodies containing cyanogen, the base of the poisonous prussic acid. With the exception of the almond, these flavors are not often imitated, but a substance made from coal tar, known as nitro-benzole, has an intensely strong taste and odor of bitter almonds, and under the name of oil of mirbane is employed to a considerable extent as a perfume and flavoring extract. It is, however, a powerful poison, and should never be added to food. Vanilla, as is well known, is the product of a Mexican plant. When pure, it is perfectly wholesome, but it has been said to sometimes undergo a spontaneous decomposition, which renders it dangerous. This, however, is not fully confirmed, and the bad effects observed may have been due to other causes. It contains a substance commonly known as vanilline, but chemists distinguish it by the brief appellation methylprotocatechuic aldehyde. This is now made artificially, in large quantities, from the gum of the spruce and other coniferous trees.

There are many other organic bodies which possess very characteristic odors, although not commonly used for flavoring purposes. Formate of ethyl is sometimes used to give an agreeable taste to rum. Acetic ether, or acetate of ethyl, has the fragrance of cider, while acetacetic ether, $C_2H(C_2H_3O)HO.OC_2H_5$, has the odor of new-mown hay. Ethyl nitrite has a pleasant, apple-like smell, while amyl nitrite has an odor peculiar to itself, which produces such remarkable physiological effects that it is extensively used as a medicine. Salicylate of methyl occurs in the oil of wintergreen (checkberry), and was one of the first vegetable products prepared artificially. With the exception of nitro-benzole, all the artificial flavors mentioned above are composed of three elements only—carbon, hydrogen, and oxygen.

All the wide differences in odor, taste, and chemical behavior are due to slight variations in the proportions of these elements, and probably, also, to the position in which their atoms are arranged in the molecule. Strictly speaking, the only difference between the odorless glucose and the fragrant pineapple oil is that the latter contains four atoms less of oxygen, and the relation between the chemical composition and the physical properties of the organic bodies is a most important but still unsolved chemical problem.

We may hope to know much more in the future, as many skillful and patient investigators are hard at work upon this very subject. Although many of the above flavors are so strong that only a very small quantity is necessary to flavor a large amount of food, yet their use cannot be recommended. They are unwholesome, to say the least, and some are actually poisonous. Only natural fruit flavors should ever be allowed in the kitchen, and the cheap artificial essences should be left in their proper place, on the shelves of the chemist's laboratory.—*Popular Science News.*

© 1888 SCIENTIFIC AMERICAN, INC.

Bottle Papers.

One of the interesting travelers known as "bottle papers," and which was set afloat by our old friend Captain Henry Plater, of the ship Patriarch, has just come to hand. The following are the particulars:

The Patriarch was on her voyage to Sydney, passengers all well, when, on 1st April, 1887, in latitude 1° 7′ S., longitude 25° 54′ W., the bottle was thrown overboard, and a slip of paper with the above details was inclosed within it.

The bottle was eventually picked up on the shore of Galveston Island, in the Gulf of Mexico, having traversed (through the aid of the equatorial current) the Atlantic from the point of jettison to Trinidad or Tobago; thence it passed to the Caribbean Sea, and when opposite Cape Gallinas it trended to the channel between Yucatan and Cuba, passing thus into the Gulf of Mexico. It probably took the round of Campeachy Bay, thence traversing the west side of the Gulf until off Galveston Island. It was picked up on the 18th May, 1888, by Henry Middelegge, who was collecting driftwood along the shore. Thus in 413 days it was carried by the current not less than 5,500 miles, being at an averge rate of 13½ miles per twenty-four hours.

Another of Captain Henry Plater's "bottle papers," which had been thrown overboard six days earlier, has reached us. It is to the following effect:

The Patriarch, 14 days out from London, and bound to Sydney, was in latitude 12° 55′ N., longitude 25° 47′ W. All well.

This bottle was picked up at Ambergris Cay, British Honduras, on the 25th of May, 1888. Taking the Cay to be in latitude 18° 6′ N., longitude 87° 50′ W., the bottle traveled for some time probably on the northern edge of the equatorial current, though afterward getting into its heart, a distance of 3,620 miles on a course N. 84° W., which gives the current a mean rate of 8½ miles a day. The rate would, from the position, be slow at first, and subsequently accelerated.

Mr. A. G. Allan, of Te Kao, North Cape, New Zealand, writes as follows:

While traveling on the Seventy-Mile Beach, West Coast, about a mile north of the small islet called Motu Pea, on May 4, one of the natives of Te Kao observed a bottle stranded on the beach, and found it contained a paper. He broke the bottle and abstracted the document. According to instructions given on former occasions, it was brought to me. On perusal it proved to be one of the marine cards cast into the sea to ascertain the direction of the ocean currents, by order of the Imperial Board of Admiralty in Berlin, from the ship-of-war Bismarck, on her voyage to Sydney, two years and three months ago. The card, which is printed in the German language, is considerably chafed at both ends, and some of the words are obliterated; but the main portion of the print and writing is perfectly legible. I give the translation:

"This bottle was put overboard at noon on February 15, 1886, in latitude 47° 17′ S., longitude 111° 56′ 50″ E. from Greenwich. Ascher, on board the ship Bismarck, on a voyage to Sydney. Whoever finds this paper is requested to send it to the Imperial Admiralty in Berlin." It is also requested that the finder should add some particulars as to the time and place at which the bottle was found. The existence of an ocean current setting in from the Indian Ocean toward the southern end of New Zealand is a fact well known for many years. It strikes the southern end about the Bluff and chiefly passes to the eastward, but apparently New Zealand to some extent divides it, and though the bulk passes to the eastward, a small stream comes up to the westward of New Zealand, and naturally impinges against the western side of the northern part of the Auckland provincial district. The bottle, when thrown overboard, probably traveled with the easterly set that runs southward of the Australian continent, thence through Bass' Strait, and onward toward the coast of New Zealand.—*Nautical Magazine.*

Adulteration of Food.

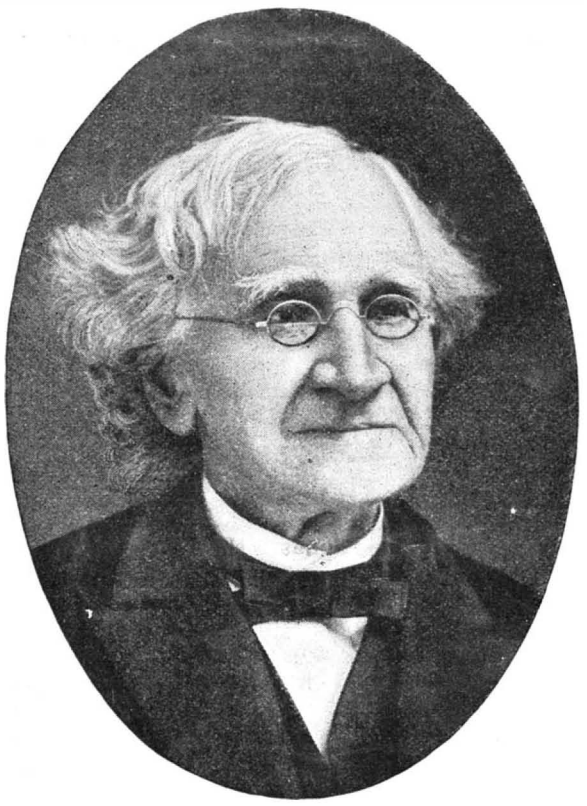
In reporting favorably to the House a substitute for the Lee bill to prevent the manufacture or transportation of adulterated articles of food, drink, and drugs, made in one State and intended to be sold in another, the House committee on agriculture, referring to the extent of adulteration, says:

"This state of facts amounts not only to a premium upon dishonesty, but is a threat to national health. Honest manufacturers and dealers are placed at a disadvantage or are forced into a reckless competition with fraud. Legitimate trade is handicapped and demoralized. It tends to make an Ishmaelite of both manufacturer and dealer. Recent investigations in the department of agriculture of cheese deceptions, frauds in milk, adulteration in beer and spirits, in spices and condiments and other things in daily use as food and beverage, emphasize the necessity for prevention or repression of these disreputable practices stimulated by the greed of gain. Liquids, perhaps, even more generally than solids, are subject to this sophistication. Aged brandies are made from diluted alcohol; cheap wines are mixed and manipulated to imitate expensive brands; beers are doctored to avoid the use of expensive hops, and to cheapen the product or simulate some desired quality. Teas are mixed, colored with poisonous minerals, and spent leaves are dried and placed a second time upon the market. The animal industry which asks for the protection proposed in this bill reaches all the levels of life from the millionaire to the day laborer. It embraces more than all other industries in the country combined, the property of the poor."

OUR FIRST IMPORTED LOCOMOTIVE.

The first locomotive imported into this country was bought in Manchester, England, of the Stephenson Company, by Kirk Boott, for the Boston and Lowell Railroad corporation. It arrived in this country in 1834, and, for convenience of transportation, had been stripped as far as possible, and upon arrival in Boston was placed on several boats of the Middlesex Canal Company and drawn to Lowell. With the locomotive came a planer and tools for building locomotives, and as soon as patterns could be prepared a new locomotive was commenced. The imported machine was put together, and named "The Stephenson," in honor of the builder.

The new engine made at Lowell was named "The Patrick," after the president of the corporation, Patrick T. Jackson. This locomotive was completed three or four days before the Stephenson made its trip. The Stephenson weighed eight tons, and had four



MR. ELI COOPER AT THE AGE OF 84 YEARS.

wheels, with outside connections. The boiler had 113 tubes, which were small and intended for burning coal; but in using wood they became clogged, and in order to clear them out the locomotive was stopped, and the fireman cleaned them with a long rod. The coach which was used in the trip was a small affair, with seats upon the side. The first trip was made from Lowell in June, 1835, and the distance, 26 miles, to Boston, made in seventy-seven minutes. The return trip was made in eighty minutes.

John Barrett was the first conductor and Eli Cooper, whose portrait is given herewith, the engineer. The passengers were: Patrick T. Jackson, James F. Baldwin, the engineer, Major George Whistler, and associates. Directly after the opening of the road, "The Patrick" was put on, and after running four years "The Stephenson" was put in the machine shop and made over by Eli Cooper and others.

Mr. Cooper is now living in Woburn, Mass., at the age of 84. He was born in Stockport, England, December 16, 1804, and came to this country with his parents in 1806. In 1824 he went to Lowell, where he learned the machine trade, and worked for the Locks and Canals Company, the Lowell Machine Shop, and the Boston and Lowell Railroad Corporation.

Work in the Navy.

While the good work of building new vessels of war progresses, the old wooden ships are not being entirely neglected. At the various yards considerable work is being done in the way of rebuilding and repairing a number of these now old but still useful crafts. At the Portsmouth, N. H., yard the Kearsarge is being extensively repaired, and will be ready for her officers October 1. The estimated cost of the repairs to this ship will be $47,792.26. At the same yard the training ships Saratoga and Portsmouth will be entirely rebuilt, at an estimated cost of $68,000, and will be ready about the first of the year. At the New York yard the Richmond is fitting out, ultimately to be the flagship of the Asiatic station, and will cost, when completed, $20,596.94. She will be ready for sea in about two months from the present time.

At the Norfolk yard the Pensacola, which will be flagship of the North Atlantic squadron, is being repaired, and the estimated cost to complete her entire is $27,311. She will be ready in about five months. This ship will receive an entire new set of boilers, which are now being forwarded from the Washington Navy Yard, where they have been in store for some time.

The double-turreted monitor Puritan will shortly be sent to the yard to be rebuilt, in accordance with an act of Congress approved August 3, 1886. The training ship Jamestown will also be repaired at this yard, at an estimated cost of $12,000, and be ready in about three months.

At the Mare Island yard the greatest amount of work is being done. The Iroquois is nearly ready, and her estimated cost, when finished, will be $29,400. She will be ready for sea September 15. The steamship Monongahela is also being overhauled and repaired at this station, at an estimated cost of $25,000. She will be sent again to the South Pacific as storeship of the station, with headquarters at Payta, Peru. She will be ready October 1.

The surveying steamer Ranger is being fitted for one year's service on the Pacific coast at an outlay of $9,200, and is now ready to proceed with her work. The Mohican is now in the dry dock, and after some slight repairs are put on to enable the ship to leave the dock, she will be repaired at an estimated cost of $14,800, and be ready in sixty days.

The Vandalia and Adams, of the Pacific squadron, are now on their way to the Mare Island yard for repairs, and it is expected both ships will be there by the middle of October. The double-turreted monitor Monadnock is being rebuilt also at the California yard, at an estimated cost of $600,000, and will be ready in about two years.—*Army and Navy Journal.*

Hydrographic Expedition.

Commodore Walker, chief of the Bureau of Navigation, has decided to send another expedition of naval officers to Mexico and Central America to make the necessary observations in various points in those countries, in continuance of the important work of determining secondary meridian of longitude by the use of the telegraph. Commodore Walker has from the beginning been most enthusiastic over this species of scientific work, and has given much time and attention in bringing it to perfection. Lieut. G. L. Dyer, hydrographer to the bureau, has been a most able assistant to his chief, and all of the officers on duty in the hydrographic office, in fact, the entire service, are much interested in this particular work, which is attracting the attention of the scientific world.

In the last work of this kind, which was finished about three years ago, the chain of longitudes was carried from Galveston, Texas, to Vera Cruz, on the Gulf coast of Mexico; also from Panama up the west coast of Central America to Libertad in Salvador. It is now proposed to connect these points. From Vera Cruz a submarine cable extends to Coatzacoalcos on the Isthmus of Tehuantepec. Thence a land line extends across the Isthmus to Salina Cruz on the Pacific, and from this point a cable is carried down the coast. In making this measurement, Vera Cruz and Coatzacoalcos will probably be the first points occupied. An observing party will be stationed at each of these places, and the difference of longitude between them will be determined. The exact longitude of Vera Cruz being already known, it will be only necessary to apply this difference of longitude to that position to give the position of Coatzacoalcos. This being done, the Coatzacoalcos party will cross the Isthmus to Salina Cruz and the Vera Cruz party will occupy the Coatzacoalcos station, and thus the work will proceed until all the links of the chain have been measured, when the expedition will return. The stations occupied will probably be the following, viz.: Vera Cruz, Coatzacoalcos, and Salina Cruz in Mexico, Libertad in Salvador, and San Juan del Sur in Nicaragua.

The expedition will leave the United States about the middle of November, in order to arrive in Mexico at the beginning of the dry season, as clear and dry weather is absolutely necessary for the requisite astronomical observations.

The following officers will be detailed for this service, viz.: Lieutenant J. A. Norris in charge, Lieut. Charles Laird and Ensign J. H. L. Holcombe, together with another officer who has not yet been selected. These officers are all experienced in the work. Lieut. Norris has been connected with all the longitude expeditions sent out by the Bureau of Navigation since 1874, Lieut. Laird first became connected with the work in China in 1881, and Ensign Holcombe is experienced in similar astronomical work, though he has not before assisted in measuring longitudes.

Five months will probably be necessary to complete the measurements, and the party will return home early in the spring of 1889. Several months will be employed in making the computations, and the results will then be published.—*Army and Navy Journal.*

© 1888 SCIENTIFIC AMERICAN, INC.

ENGINEERING INVENTIONS.

A rotary engine has been patented by Mr. John Marvin, of Northport, N. Y. The plates which form the steam chest are made to rotate upon a fixed shaft, through which steam is admitted to and exhausted from the chest, the pressure being equal at all points of the revolution and there being no dead centers.

A car heater has been patented by Messrs. George W. Carter and William T. Pickett, of Canyonville, Oregon. It has a water base, with pipes which conduct the water to the interior of the stove, and a guard or casing outside to prevent the contact of the heated surfaces of the stove with combustible material, making a self-extinguishing stove.

A station indicator has been patented by Mr. George C. Logan, of New Orleans, La. This invention covers a novel construction and combination of parts, providing means whereby an approaching station may be indicated within a car, and the apparatus containing the names of the several stations may be operated from the engine or car, the apparatus being simple and durable and easily manipulated.

A car coupling has been patented by Mr. John P Turney, of Arlington, Oregon. This invention covers a novel arrangement of pneumatic couplings and tubes, extending to the cab of the engineer, in combination with a compressed air reservoir and a switch conduit for directing the air blast through any of the tubes to any of the couplings, the coupling and uncoupling being effected by the engineer.

A railroad rail has been patented by Mr. Gilbert A. Ewing, of Jackson, Ohio. It is of the class of rails formed of two longitudinal interlocking sections, and the invention provides practically an endless rail, with which chairs and fish plates will not be needed, and wherein but few locking devices will be required, the rails also having an oval space between the webs of sections adapted to carry insulated telegraph wires.

MISCELLANEOUS INVENTIONS.

An inhaler has been patented by Mr. Almon K. Ives, of Missoula, Montana Ter. It has a powder receptacle with small perforations in its top and a suitable handle, with compressible air bulb and flexible tube, for forcing air into contact with the powder and expelling portions of the powder with the air.

A printer's galley has been patented by Mr. Frederick Schley, of Brooklyn, N. Y. The side and end pieces have a rib on the outer edge at the bottom, over which the bottom piece is bent and held in engagement therewith, thus reducing the cost of manufacture and making a galley that will stand hard usage.

A pole attachment for vehicles has been patented by Mr. William P. Fest, of Brooklyn, N. Y. The running gear of the vehicle has longitudinally extending spurs, and the pole has eyes, one in advance of the other, adapted to receive the spurs, whereby the fitting of the pole will be facilitated, and all rattling at the connections will be avoided.

A gun sight has been patented by Mr. George W. Wood, of Granville, N. Y., and James W. Carver, of Pawlet, Vt. This invention provides in one attachment a sight applicable for use at either a short or long range, and which may be used to gauge the wind, and also affords the advantages of a peep or closed sight and an open sight.

An animal trap has been patented by Mr. William H. Harden, of Quitman, Ga. It is designed mainly for rats, the invention covering a novel construction of the cage, in combination with suspending, tripping and locking mechanism, and automatically opening doors which permit the animal to enter, but do not allow of escape.

A seal lock has been patented by Mr. George W. Lewis, of Portsmouth, Va. It has a slotted metallic casing, a locking block eccentrically pivoted therein, having a lip with a perforation, in combination with a fragile seal, being especially adapted for securing a freight car door, so that the fastener cannot be released without breaking the seal.

A puzzle has been patented by Lizzie E. Simpson, of New York City. It consists of a board provided with a series of pin apertures arranged in intersecting lines and baffle apertures promiscuously arranged upon the board, contiguous to the lines of pin apertures, being intended to afford an interesting study and pastime to children and adults.

A washing machine has been patented by Mr. John W. Lasswell, of Augusta, Kansas. It is a machine of that class in which two oppositely reciprocating rubbers are employed in a tub or vat, the invention covering novel details of construction, designed to provide a machine which will be thoroughly effective, simple, and durable.

A galvanic battery has been patented by Mr. Howard Cassard, of Baltimore, Md. It has a cover formed as a cup with a liquid seal, and a bent tube communicating with the fuming cell of the battery and trapped in the liquid seal, with other novel features, the battery being designed with reference to greater efficiency and to prevent the escape of gases.

A well has been patented by Mr. Henry Piering, of New York City. This invention covers a metallic cylindrical curb support, with teeth on its bottom, perforations around its body, and a flange on its top, to be placed in the bottom of a partly excavated well hole and sunk to the desired depth as the masonry wall is built up from the flange.

A corn husker has been patented by Mr. Theodor H. Mehring, of Niobrara, Neb. It is an implement which may be worn upon the bare hand, or upon the hand when incased in a glove or mitten, being made in two sections, sliding one upon the other, the device being simple and cheap, and capable of quick adjustment to suit the breadth of any hand.

An elevator and conveyor for unloading and loading vessels, etc., has been patented by Mr. James F. Simmons, of Manistique, Mich. This invention covers a novel combination and arrangement of parts in a machine having a universal adjustment, permitting its use in many positions, as for transferring goods from a vessel to a car and *vice versa*, and for various other purposes.

A lock has been patented by Mr. Henry Van Hoevenbergh, of New York City. This invention relates to what are known as "pin tumbler locks," especially adapted to places in which the control of the lock is limited to a given time or particular persons, and is intended to obviate the necessity of changing the lock when a change of ownership or control is made.

A middlings purifier has been patented by Mr. Victor Monnier, of Dundas, Minn. The interior of the machine is in separate compartments, the air currents of which are regulated independently, whereby each grade of material may be treated separately, without affecting the other grades, and there are various other novel features of construction and combinations of parts.

A sad iron has been patented by Mr. Horace S. Pease, of Cincinnati, Ohio. This invention relates to a former patented invention of the same inventor, the fluting plate being made attachable and detachable, and to serve also as a shield to protect the operator's hand from contact with the hot chimney and from the heat arising from the heated smoothing iron.

An apparatus for the manufacture of charcoal has been patented by Mr. Jacob Scherffius, of Winona, Minn. The charring of the wood is effected in a chamber about which the products of combustion pass without entering, the heated air being continuously used, while provision is made for gathering and condensing all products given off by the wood during the processes of charring.

A spring bed bottom has been patented by Mr. Anthony Huber, of New York City. The body of the spring bottom is formed of thin metal cross strips, riveted together at their intersections, at which points are attached spiral springs, the construction being such that the springs can be readily applied where desired and conveniently removed when the cot is to be folded.

A feed bucket has been patented by Mr. Albert M. Smith, of Westerly, R. I. It has a frame with inwardly extending arms holding a spring upon which rests a feed receptacle, a detachable partition being held within the receptacle, whereby the horse will be unable to obtain more feed at a time than he can conveniently eat, and wherein also there will be no waste.

An ice velocipede has been patented by Messrs. George B. M. Ribble and Charles C. Spencer, of Cortland, N. Y. It is made in triangular form, and so that the front runner and main frame have free up and down movement independent of the two rear runners, and is provided with a propelling mechanism of novel character to be operated by the feet of the rider.

A smoke consumer has been patented by Mr. Robert H. F. Sewall, of Birmingham, Ala. Combined with a furnace is a superheating chamber, the smoke passage communicating therewith, an oil supply pipe leading into the chamber, and a perforated burner pipe, with other novel features adapted to securing a more perfect combustion under various forms of construction.

A drier has been patented by Mr. Arthur Buel, of New York City. It has sections of porous refractory material secured to frames and connected to form an endless apron, with drums over which the apron passes, in combination with furnace openings and a drying oven, and other novel features, the invention being especially applicable in the drying of white lead, whiting, and other pigments.

A combined cradle and rocking chair has been patented by Messrs. William Furl and Rudolph Fraenzel, of Lock Haven, Pa. The construction is such that a rocking chair may be conveniently drawn out of the crib frame and adjusted for use, and get readily adjusted for telescoping therein, the several rockers assuring a strong support for both the chair and cradle.

A tobacco pipe has been patented by Messrs. Thomas B. Whitledge, George W. Kenner, and Michael Rueckert, of St. Mary's, Mo. Combined with an apertured cap are various parts operating in relation to each other, the cap, and the interior of the bowl, to prevent the tobacco from falling from the bowl, for pressing it more closely or loosening it, or for scraping and cleaning the bottom of the bowl.

An ice creeper for horses has been patented by Mr. Charles S. Acheson, of Philadelphia, Pa. The body of the creeper is formed of a flat plate adapted to set up against the forward part of the bottom of the shoe, and having a recess fitted to receive the toe, with threaded sockets in which spurs are inserted, the creeper being attached to the horse's foot by a strap and buckle.

An apparatus for transporting and setting stone has been patented by Mr. Donald McDonald, of Louisville, Ky. Combined with a suitably supported and adjustable mast is a cable having its end portions disposed around guides on the mast, with other novel features, forming an apparatus designed to facilitate the lifting of stone, carrying it and lowering it in position, as required in building bridge piers, constructing buildings, etc.

A fireplace forms the subject of a patent issued to Mr. Robert B. Berrie, of Lexington, Mo. The grate has a rearwardly inclined back, above which is held a corrugated top plate, a fixed hood being held in front of and above the top plate, and a flat plate held to slide thereon, to increase or diminish the opening between the top plate and hood, whereby the draught can be easily regulated and the heat directed into the room.

A last block fastener has been patented by Mr. William Cook, of New York City. The last block has in its under side a slot open at its upper end, the block having a countersunk recess, and the fastener having a shank connected with the last body and constructed with a flattened head, in such manner that the head may be grasped by the ordinary pinchers or pliers, the fastener being quickly and easily manipulated to lock the block in place or allow of its removal.

A fifth wheel has been patented by Messrs. Jonathan G. and Lemuel H. Huff, of East Bend, N. C. The lower fifth wheel section, secured on the axle iron, has a king bolt opening formed through it leading to the axle iron, and is provided with a keyway or slot, the upper section having a king bolt with a key fitted to the keyway of the lower section, such king bolt being extended through the opening in the lower section and bearing at its lower end on the axle iron.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

SCIENTIFIC AMERICAN BUILDING EDITION.

AUGUST NUMBER.—(No. 34.)

TABLE OF CONTENTS.

1. Elegant plate in colors of a dwelling at Glen Ridge, N. J., with floor plans, sheet of details, etc. Cost, eight thousand five hundred dollars.
2. Plate in colors of a fire engine house of moderate cost. Details and floor plans.
3. Perspective view and floor plans of a residence at Black Rock, Conn. Cost, six thousand dollars.
4. Sketch of an uptown block of attractive residences, New York City.
5. Floor plans and perspective elevation of two Queen Anne cottages, lately completed at Bath Beach, Long Island. Cost, four thousand dollars each.
6. Design and floor plans for a two thousand dollar house lately built at Bridgeport, Conn.
7. Perspective and floor plans of an attractive residence lately built at Bridgeport, Conn. Cost, two thousand eight hundred dollars.
8. A six hundred dollar cottage built lately at Bridgeport, Conn. Perspective and floor plans.
9. Plans and perspective view of a seaside cottage lately erected at Bath Beach, Long Island. Cost, three thousand five hundred dollars.
10. Engraving and floor plans of a neat little double house lately erected at Bridgeport, Conn., costing one thousand eight hundred dollars.
11. A country residence in France. Perspective and plans.
12. Engraving of the palatial stables of Mr. D. Edgar Crouse, Syracuse, N. Y.
13. Plans and perspective for a carriage house, barn, etc. Cost, two thousand two hundred dollars.
14. Elevation and floor plans for a double house costing complete four thousand two hundred dollars.
15. New Congregational Church at Beckenham, Kent, England.
16. Page of designs of New England residences.

Miscellaneous contents: Vegetable glue.—Fourth of July fires.—The slag water closet.—Rust in water pipes.—Laying out the joints of an elliptical vault, illustrated.—The tulip and other trees.—Architectural school houses.—Hanging baskets.—To estimate the power of a stream.—Manufacturing progress in the South.—How to grow quinces.—Mixed wheats.—New ceiling for the Assembly chamber of the New York State Capitol.—Transplanting large pines.—Galveston artesian wells.—Poisonous wall paper and carpets.—The testing of Portland cement.—The humming bird.—Manila hemp in plaster.—A perfect hen house.—Examination questions for plumbers.—Road improvements.—The "Patten" metallic shingles and siding plates, illustrated.—The pool of Bethesda.—Carl Pfeiffer.—Creosote wood preserving stains.—House heating by hot water circulation, illustrated.—Ohio's largest poplar.—Mortar.—Irrigating wheels.—Liquid fish glue.

The Scientific American Architects and Builders Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

All books, app., etc., cheap. School of Electricity, N.Y.

Talcott's combination patent belt hooks, self-clinching, and Wilson's hook in one fastener. Providence, R. I.

Wanted—Capitalist to assist me financially in perfecting valuable inventions for one-half interest. Address "M.," Novelty Sign Works, Covington, Ky.

Wanted—A mechanic in every shop in the world to act as agent. No interference with regular work. No capital. Free samples and good commissions. Send for samples and particulars to F. N. Carter, 176 St. Clair St., Cleveland, O.

A System of Easy Lettering. By J. H. Cromwell. 26 plates. Price, 50 cents. E. & F. N. Spon, 12 Cortlandt St., New York.

Steam Launches.——New catalogue (free) by Chas. P. Willard & Co., 236 Randolph St., Chicago.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

Pratt & Letchworth, Buffalo, N. Y., solicit correspondence relative to manufacturing specialties requiring malleable gray iron, brass, or steel castings.

For the latest improved diamond prospecting drills, address the M. C. Bullock Mfg. Co., Chicago, Ill.

Nickel Plating.—Manufacturers of pure nickel anodes, pure nickel salts, polishing compositions, etc. $100 "*Little Wonder.*" A perfect Electro Plating Machine. Agents of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty St., New York.

Perforated metals of all kinds for all purposes. The Robert Aitchison Perforated Metal Co., Chicago, Ill.

The *Railroad Gazette*, handsomely illustrated, published weekly, at 73 Broadway, New York. Specimen copies free. Send for catalogue of railroad books.

The Knowles Steam Pump Works, 113 Federal St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Link Belting and Wheels. Link Belt M. Co., Chicago.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Lockwood's Dictionary of Terms used in the practice of Mechanical Engineering, embracing those current in the drawing office, pattern shop, foundry, fitting, turning, smith's and boiler shop, etc., comprising over 6,000 definitions. Edited by a foreman patternmaker. 1888. Price, $3.00. For sale by Munn & Co., 361 Broadway, New York.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Duplex Steam Pumps. Volker & Felthousen Co., Buffalo, N. Y.

Catalogue of Books on Civil, Mechanical, and Electrical Engineering, Arts, Trades, and Manufactures, 118 pages, free. E. & F. N. Spon, 12 Cortlandt St., New York.

Iron, Steel, and Copper Drop Forgings of every description. Billings & Spencer Co., Hartford, Conn.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Friction Clutch Pulleys. The D. Frisbie Co., N.Y. city.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 28.

Pedestal tenoner. All kinds woodworking machinery. C. B. Rogers & Co., Norwich, Conn.

Rotary veneer basket and fruit package machinery. I. E. Merritt Co., Lockport, N. Y.

☞Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) Subscriber asks: Is there such a thing known as anything being set on fire by spontaneous combustion? If so, when, how and where? A. Wet hay in stacks, and oily cotton waste, such as accumulates in mills, often becomes ignited by spontaneous combustion. Spongy platinum will ignite hydrogen gas. Other instances could be cited.

(2) D. T. G. writes: I wish to get 1 ohm resistance with a length of wire of about 3 feet. A. German silver has about 13·6 times the resistance of copper wire, 2·75 feet of No. 24 (American wire gauge)

© 1888 SCIENTIFIC AMERICAN, INC.

German silver wire will have about 1 ohm resistance. It will be an approximation only, as every sample of wire varies more or less.

(3) C. C. wants to know how many coats of lacquer should be put on gas fixtures, for ten years' wear, and how to make the different colors. Can it be put on hot? If so, what is the process? A. Only heat the articles to about 200° Fah. before lacquering. For the process and how to make lacquer, see "Techno-Chemical Receipt Book," which we can mail for $2.

(4) C. B. P.—The crank pin of an engine is supposed to travel with an even motion or as nearly so as the fly wheel can control, considering the unequal pressure upon the piston in the first and second half of its stroke. The impulse given during the first half of the piston stroke slightly accelerates the crank velocity. It is the piston itself that has a variable motion under the regulating influence of the fly wheel, so that from the dead center to the first quarter revolution of the crank, the piston travels farther than for the second quarter, or to the next dead point; the difference being greater for a short connecting rod.

(5) H. W. S., Jr., writes: I have a cistern from which a lead pipe connects with a pump in the kitchen. The water is of a yellowish cast and very foul. The water drawn from the neck of the cistern with a bucket is of good taste and void of odor. Can you give me a remedy. A. The surface water of your cistern is purified by absorption of air. There is no circulation by which the water at the bottom is brought to the surface. The oxygen or air that is carried into the cistern, combined with the water, is soon absorbed in oxidizing the vegetable and other matter in the water. When no more oxygen is available a putrid decomposition sets in, which is the trouble that you complain of. The only remedy is thorough and often cleaning of the cistern, or forcing air down to the bottom, allowing it to bubble up through the water. A small force pump will answer the purpose. A bag of charcoal pushed down to the bottom, and held there, may improve the water.

(6) F. G. B.—You can remove most of the old varnish from your guitar by rubbing the scratched parts with 95 per cent alcohol on a clean rag until the color appears even, then varnish with a mastic varnish, using a flat camel's hair brush, going over the work quickly. You may make the mastic varnish by dissolving 12 parts sandarac, 6 parts shellac, 6 parts mastic, and 3 parts elemi in 150 parts 95 per cent alcohol. Put the whole in a bottle and warm in a water bath until the gums are dissolved, then add 6 parts of Venice turpentine and thoroughly shake up warm. If too thick to spread freely, add alcohol to suit the requirement.——For hardening small tools, rub soap upon the surface, and in the threads of taps and dies, then heat to a cherry red and immerse in salt water, a handful of salt to half a pail of water.

(7) B. W.—For a good cup grease melt and thoroughly mix while hot equal parts fresh clarified tallow and heavy petroleum oil or engine oil. For axle grease add to the above 15 per cent by weight of ground plumbago. Stir well while cooling, to make the mixture perfect.

(8) C. H. C. asks a receipt for the cleansing of oil drippings, such as caught in the pans under the bearings of shaftings, so that the oil can be used again. A. The purification of such oil drippings by chemical processes is entirely unsuited to ordinary shop work. We can only recommend settling the oil in a large open can and dipping from the surface. If this does not make it clear enough for use, fill the can half full of water, or filter the settled oil through a sponge stuffed in the bottom of a can.

(9) F. M. desires a formula for making dark mahogany stain from aniline for furniture and chairs, one that will not fade. A. We would recommend the following in preference to aniline. Boil half pound madder and 2 ounces logwood chips in 1 gallon water and brush well over while hot. When dry go over with pearlash solution, 2 drachms to the quart. By using it strong or weak, the color can be varied.

(10) A. P. Y. desires (1) a formula for bleaching hair. A. For bleaching the hair use a three per cent solution of peroxide of hydrogen, concerning which, its preparation and application, see the article on that subject in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 339 and 545. 2. Also same for the menthol pencil for headache. A. Menthol having a melting point of 42° C. is fused and then poured into metal moulds. Usually, however, the menthol is diluted by mixture with varying proportion of wax, stearine, or paraffine.

(11) T. B. asks: 1. Is there any substance or method by which froth on a saccharine liquid could be avoided or killed, for instance in aerated mineral waters? A. A little vapor of ether will tend to do it. A drop of ether in each bottle would answer. 2. Could you give me a good and cheap recipe for peppermint cordial? A. To 40 gallons proof spirit add 4 ounces essence of peppermint dissolved in 95 per cent alcohol. Color with ½ pound powder of turmeric infused in 1 gallon spirit 95 per cent.

(12) M. M. H. writes: At the recent eclipse of the moon, the earth's shadow appeared as a thin veil over the surface of the moon, the light shining through with a dull reddish hue. If the moon at this time of her opposition was exactly in her node, consequently totally eclipsed, why was any light visible? It seemed different in this respect from any previous total eclipse. A. The moon was nearer to the earth in this eclipse than in others less remarkable. The light on the moon during totality was derived from the sun rays refracted by the outer or thin portion of the earth's atmosphere. The outer atmosphere being a globe of very low density, acted as a lens, drawing the sun's rays in and crossing the earth's dark shadow.

(13) G. G. writes: I have been using asphalt varnish to renew the gloss on rubber boots and shoes, which in a degree is a success. Can you suggest any addition to perfect the same, also to kill the fume of the asphalt? A. Asphalt varnish is the only article that we know of that can be used for the purpose mentioned, and we can only suggest, as there are various grades of that varnish, that you secure the best.

(14) J. B. writes: Can you furnish me a recipe for making "papyrograph writing paper," like the piece inclosed? A. The paper is saturated with a resinous varnish, and you will find in Spons' "Workshop Receipts," second series (which we can send you post paid for $2), a description of its treatment. Try paper brushed over with boiled oil in which a little shellac has been carefully dissolved over a slow fire, then suspend on a line till dry.

(15) C. F. S.—S is right. The hydrostatic pressure is the power that discharges the water. It is always equal for equal heights without reference to the area of surface.

(16) A. E. S. asks: Which possesses the greater strength when placed horizontal, standing on highest edge—a piece of timber 40 feet long, 12×18 inches, or piece same length, but 14×16 inches? A. The 12×18 inches is the strongest, its moment of inertia being 5,832, while the moment of inertia of the 14×16 beam is only 4,778, and their safe load at center 6,026 pounds and 5,555 pounds.

(17) F. C. M. asks how to make the ordinary torpedoes, such as cost about five cents a package. A. They consist simply of a few grains of coarse sand twisted in pieces of paper containing a small quantity of fulminate of mercury.

(18) H. J.—The surface of the earth in one geographical mile "falls away" or departs from a straight line 8·04 inches.

(19) H. S. T. asks: The process of dyeing in colors sheep skins that have been tanned with wool on. A. To dye the hair on the leather, use receipts similar to those employed in dyeing ordinary wool. Anilines for instance can be used, but in order to avoid spoiling the fur, you had better consult some of the text books on dyeing.

(20) J. A. H. asks: 1. How to make the menthol or "Japanese headache cures," not hard as they are, but in a liquid or semi-liquid state, as a salve or liniment, to be rubbed on different parts of the body, etc. A. Menthol cones are made by mixing menthol with various waxes. It is the proximate principle in oil of peppermint, and can be obtained by cooling the oil to 15° C., whereupon the menthol crystallizes out of the oil. 2. A grape sirup, not an artificial sirup, or one for fountain use, but a sirup from the fruit, for domestic or table use, etc. A. Take 20 lb. ripe freshly picked and selected tame grapes, put them into a stone jar and pour over them 6 quarts of boiling soft water; when sufficiently cool to allow it, well squeeze them thoroughly with the hand, after which allow them to stand 3 days on the furnace with a cloth thrown over the jar, then squeeze out the juice and add 10 lb. of crushed sugar; let it remain a week longer in the jar; then take off the scum, strain and bottle, leaving a vent until done fermenting, when strain again and bottle tight, and lay the bottles on the side in a cool place. 3. A decoction, infusion, or tea of malt and hops, to be used as a tonic drink, what to add to preserve it, if anything. A. Take extract of malt 4 fluid oz.; phosphate of iron U. S. P. 1880, 128 grains; water 1 fluid oz.; fragrant elixir enough to make 1 pint. Dissolve the phosphate of iron in the water with the aid of heat, add the extract of malt and sufficient fragrant elixir to make one pint; allow the whole to stand 24 hours and then filter. 4. What quantity of what substances (bicarbonate soda, etc.) to charge water with gas in bottles or siphons, to imitate fountain soda (without marble dust and acid), to gain the time necessary to cork bottle. I thought to place powders in separate gelatine capsules, etc. A. To one gallon of water add 5 lb. of loaf sugar, one ounce Epsom salts, one ounce cream tartar, and 5 oz. tartaric acid. Boil the preparation well, skimming off the refuse matter accumulating upon the surface. After cooling set it away in bottles in a cool place. When drinks are desired, put 2 or 3 tablespoonfuls of this sirup into a tumbler two-thirds full of water, add one-fourth of a teaspoonful of bicarbonate of soda, stir briskly, and the effervescence will be equal to that from fountain soda. 5. To make "Sozodont" or a close imitation of the same, or something similar and as good. A. Take of potassium carbonate ½ oz.; honey 4 oz.; alcohol 2 oz.; water 10 oz.; oil of wintergreen and oil of rose sufficient to flavor. 6. I have some suppositories made of quinine and cocoa butter; how can I find out how much quinine there is in each? Can I do this myself? Or how much cost to have this done? A. If you are an analytical chemist, the determination of the quinine can be made by known processes for which consult the usual text books. Otherwise refer the matter to an analyst, whose charges will depend upon his reputation.

(21) H. M. writes: We have a set of black hair cloth furniture that has been flooded. How can we clean it? A. The cloth can be cleaned by using the preparations recommended in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158, for cleansing fabrics from spots and stains, and the woodwork should be rubbed down with furniture polish.

(22) C. B. M. asks: 1. How long will a common horseshoe magnet retain its power of attraction? A. If an armature is kept in contact with its ends, it will last for many years. 2. How are they charged? A. By stroking in one direction with another magnet, or by placing the limbs within coils of wire and passing strong currents through the coils. 3. Can the power of the same be increased or diminished without increasing or diminishing the size of the magnet? A. Their power varies greatly, and below the maximum, without regard to size. 4. Of what is loadstone composed? And where is it obtained? A. Loadstone is an oxide of iron, Fe_3O_4, and is found in a great many localities, in Sweden, in the Ural Mountains, and elsewhere.

(23) C. S. A. writes: What kind of a wash can I use to remove tobacco stains from new pine floors? I have just finished a new house, and the mechanics have left tobacco stains upon the floors, which sal soda and hot water does not entirely remove. A. Take one part calcined soda and allow it to stand ¾ hour in 1 part slaked lime, then add 15 parts water and boil. Spread the solution thus obtained upon the floor with a rag, and after drying rub with hard brush and fine sand and water. A solution of 1 part concentrated sulphuric acid and 8 parts water will enliven the wood after above application. When dry, wash and wax the floor.

(24) I. E. P. asks: 1. How to make extract of carnation pink? A. See the article on "Perfumes and Formulas for their Manufacture," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 472. 2. A receipt for making a disinfectant which, after evaporating, leaves a pleasant odor like mint. A. Take 1 part rectified oil of turpentine, 7 parts of benzine, with the addition of 5 drops of oil of verbena to each ounce of the mixture. Almost all essential oils act as disinfectants, but their value is slight.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

August 21, 1888,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Alarm. See Fire and burglar alarm.
Alloy, metallic, Ostermann & Lacroix....388,145 to 388,147
Alloy, non-magnetic, A. H. Robert.... 388,152
Animal trap, W. H. Harden.... 388,196
Axle box, car, D. Allen.... 388,238
Axle boxes, dust guard for, J. W. Hyatt.... 388,136
Axle lubricator, J. H. Hewey.... 388,359
Axle spindle and bearing, C. V. Moore.... 388,214
Bar. See Vehicle reach bar.
Barber's chair, F. Melchior.... 388,211
Barrel heater, E. D. Hughes.... 388,045
Battery. See Galvanic battery. Secondary battery.
Battery zinc, B. Scarles.... 388,312
Batting, cotton or other, W. I. Lewis.... 388,056
Bearing, anti-friction, T. N. Subers.... 388,228
Beer, wine, etc., pasteurizing, H. Schaarwachter.. 388,153
Bird and packing box, C. I. Wooster.... 388,385
Bit. See Bridle bit.
Blast furnace, F. W. Gordon.... 388,275
Block. See Thrust block.
Board. See Multiple switch board.
Boiler. See Sectional boiler. Steam boiler.
Bolt, C. W. F. Thode.... 388,229
Bookmark and clasp, S. Powell.... 388,149
Books, identifying label for, J. M. Beers.... 388,012
Boot or shoe, W. T. Hooker.... 388,134
Boot or shoe shank, C. Cooper.... 388,263
Boot, woven felted, J. C. Hillman.... 388,042
Bottle case, E. L. Walker.... 388,325
Bottling and cask filling apparatus, L. A. Enzinger.... 388,272
Box. See Axle box. Bird and packing box. Match box. Milk box. Tool holding box.
Bracket. See Curtain pole bracket.
Brake. See Car brake.
Bridges, safety guard for railway, J. E. Childs.... 388,122
Bridle bit, overcheck, C. Davis.... 388,268
Brush, R. W. Iliff.... 388,157
Buggy top, folding, W. G. Miller.... 388,061
Buoy, sounding alarm, A. L. Woodworth.... 388,384
Burnisher and seat wheel, A. C. Esworthy.... 388,351
Button, F. Meyers.... 388,212
Buttonhole tab, S. A. Saeger.... 388,075
Button, separable, M. D. Shipman.... 388,225
Button setting machine, J. H. Vinton.... 388,232
Calculating machine, W. S. Burroughs.. 388,116 to 388,119
Camera attachment, F. A. Brownell.... 388,259
Can bodies, die for forming, G. W. Knapp.... 388,289
Cans, die for the manufacture of, G. W. Knapp.... 388,288
Car brake, J. J. Coates.... 388,262
Car brake, Wescott & Bristol.... 388,234
Car brake and starter, D. Knowlton.... 388,205
Car coupling, J. P. Turney.... 388,231
Car heater, Carter & Pickett.... 388,180
Car heater, railway, T. M. Morton.... 388,065
Car wheel, J. N. Weikly.... 388,096
Cars, attachment for railway, J. H. Williams.... 388,100
Cars, automatic station indicator for railway, T. W. Munroe.... 388,371
Cars, track device for handling, E. Prefontaine.... 388,073
Card, playing, S. Bretzfield.... 388,115
Carpet sweeper, H. W. Ruton.... 388,376
Case. See Bottle case. Check case.
Cash register and indicator, L. Ehrlich.... 388,030
Caster socket, W. P. Tracy.... 388,381
Ceiling, metallic, W. R. Kinnear.... 388,285, 388,286
Centerboard for vessels, H. W. Wells.... 388,098
Centrifugal reel, W. R. Dunlap.... 388,028
Chain wheel, R. J. Smith.... 388,317
Chair. See Barber's chair. Rail chair.
Chair, E. Eshleman.... 388,350
Check case, G. E. Bower.... 388,251
Check row attachment, L. Scofield.... 388,077
Check rower, L. D. Benner.... 388,013
Chopper. See Cotton chopper.
Churn, W. H. & C. K. Moore.... 388,064
Churn, R. C. Robinson.... 388,373
Cigar making machine, A. H. Shock.... 388,314
Cigar rolling machine, C. W. Boman.... 388,174
Circuit closer for call systems, C. E. Dey.... 388,344
Circuit closer, pneumatic intermittent, W. C. Barney.... 388,242
Clasp, L. J. Bullard.... 388,020
Cleaner. See Gun barrel cleaner.
Cloth pressing machine, D. Gessner.... 388,127
Clothes drier, J. B. Johnson.... 388,281
Clutch, C. Wehner.... 388,233
Clutch for hoisting chains, J. Byrne.... 388,022
Coat, M. Cohen.... 388,123
Collar, apparel, G. H. Barnard.... 388,011
Collar, horse, C. Block.... 388,114
Collar or cuff, E. Kipper.... 388,287
Coloring matter, blue azo, C. Duisberg.... 388,195
Conduits, machine for the manufacture of, M. Meehan.... 388,295
Conveyer, W. Griesser.... 388,194
Cooler. See Water cooler.
Coop, chicken, J. H. Brewer.... 388,016
Corkscrew, L. W. Fairchild.... 388,125
Corn sheller, A. R. Montgomery.... 388,062
Cots, folding head piece for, F. C. Hannahs.... 388,131
Cotton chopper, C. T. McIntosh.... 388,139
Cotton openers, dust trunk for, H. C. Perham.... 388,070
Coupling. See Car coupling. Thill coupling.
Cradle and rocking chair, combined, Furl & Fraenzel.... 388,191
Crib, F. C. Hannahs.... 388,130
Cuff fastener, T. E. Barrow.... 388,106
Cultivator, J. W. Kraus.... 388,206
Curtain fastener, W. M. Buchnau.... 388,018
Curtain hanger, window, C. A. Williams.... 388,329
Curtain pole bracket, Reubel & Lindberg.... 388,151
Curtain ring or hanger, J. W. Leslie.... 388,055
Cuspidors and the like, lifter for, W. H. Smith.... 388,083
Dental engine, Hood & Reynolds.... 388,200
Distilling apparatus, W. L. Horne.... 388,278
Door check, Reardon & Gardner.... 388,074
Draught equalizer, M. Frambach.... 388,353
Drawing and tracing apparatus, W. P. Thompson 388,158
Drawing knives, adjustable chamfer gauge for, W. H. Perkins.... 388,148
Dredging apparatus, A. B. Bowers.... 388,337
Dredging apparatus, hydraulic, A. B. Bowers.... 388,252
Dredging machine, A. B. Bowers.... 388,253
Drier. See Clothes drier.
Drier, A. Buer.... 388,178
Electric machine, dynamo, M. Waddell.... 388,093
Elevator. See Water elevator.
Elevators, safety apparatus for, J. A. Moore.... 388,297
Embroidering machines, holding frame for, F. Gegauf.... 388,035
Engine. See Dental engine. Gas motor engine. Motor engine. Rotary engine. Steam engine.
Engines, apparatus for heating the ignition tubes of gas motor, N. A. Otto.... 388,301
Engines, igniting apparatus for gas motor, N. A. Otto.... 388,303
Envelope opener, F. Curtis.... 388,343
Extension screen, E. L. Gray.... 388,276
Farm gate, D. W. Petticoffer.... 388,071
Faucet, A. P. Howes.... 388,362
Feed gate, automatic, H. M. Whitney.... 388,164
Fence, J. Bright.... 388,338
Fence, W. I. F. Harden.... 388,132
Fence making machine, M. T. Greenleaf.... 388,355
Fence post, R. R. Spoore.... 388,086
Fence, wire, B. Scarles.... 388,311
Fence wire twister, J. M. Borer.... 388,175
Fifth wheel, J. G. & L. H. Huff.... 388,201
Files and similar tools, handle attachment for, D. Harkins.... 388,197
Filter, F. W. Brownlow.... 388,017
Filter, F. K. Way.... 388,162
Fire and burglar alarm, combined, W. B. Murray. 388,216
Fire escape, W. H. Howard.... 388,279
Fireplace, R. B. Berrie.... 388,173
Flue, hot air, S. B. Jungkurth.... 388,364
Fodder binder, J. Frazee.... 388,053
Folding screen, H. C. Tripp.... 388,161
Food for cattle, Brinck & Rehnstrom.... 388,339
Frame. See Picture frame.
Fuel, apparatus for burning liquid as a, A. Wilkin 388,327
Fuel, apparatus for reducing and pulverizing, H. Ruddick.... 388,375
Funnel, bottle, Xander & Thomas.... 388,356
Furnace. See Blast furnace. Heating furnace. Soda ash furnace.
Furnace, A. J. Hill.... 388,360
Furnace grate, S. J. Gavin.... 388,273
Furnace grate, T. Kirkwood.... 388,204
Furnace mouths, feed water heater and lining for, Lamprey & Bugbee.... 388,367
Furnaces and stoves, automatic regulator for, E. G. & A. B. Stevens.... 388,067
Galvanic battery, H. Cassard.... 388,181
Gas distribution, system of, G. Westinghouse, Jr. 388,163
Gas lighter, electric, J. J. McGowen.... 388,294
Gas lighting and extinguishing device, automatic, R. F. Bridewell.... 388,177
Gas motor engine, N. A. Otto.... 388,372
Gate. See Farm gate. Feed gate.
Grapple, self-adjusting, A. Beckers.... 388,109
Gun barrel cleaner, J. Hartness.... 388,133
Gun sight, Wood & Carver.... 388,166
Guns, operating mechanism for turret, H. Cruson 388,356
Hanger. See Curtain hanger.
Harness, J. S. Hendrickson.... 388,040
Harness rosette, O. P. Howe.... 388,044
Harrow, M. M. Roberts.... 388,222
Harrow, spring tooth, Reed & Clark.... 388,306
Harvester, corn, H. E. Reeves.... 388,150
Hasp lock, L. Trabue.... 388,322
Hay rack, W. E. Deakins.... 388,025
Heater. See Barrel heater. Car heater.
Heating furnace, Magee & Van Vorst.... 388,293
Heel machine, G. Bresse.... 388,255
Heel trimming machine, C. H. Trask.... 388,230
Holder. See Music holder. Oil can holder. Paper holder. Photographic plate holder. Plate holder.
Hook. See Snap hook.
Horse boot, C. C. Schild *et al*.... 388,313
Horses, ice creeper for, C. S. Acheson.... 388,171
Horseshoe, C. Miller.... 388,215
Hose nozzle, E. R. Tomlinson.... 388,159
Hubs, sand band for wheel, A. Wright.... 388,237
Hydrant, P. W. Bailey.... 388,010
Indicator. See Station indicator.
Ingots, forming, J. B. D. Boulton.... 388,336
Inhaler, A. K. Ives.... 388,202
Insecticide, J. T. Simpson.... 388,315
Insoles, machine for turning the channel lips of, S. H. Howland.... 388,280
Iron. See Soldering iron.
Jack. See Lifting jack. Wagon jack.
Joint. See Railway rail joint.
Justifying apparatus, J. Thorne.... 388,088
Kiln. See Wood drying kiln.
Knitting machines, trimming device for, E. C. Covell *et al*.... 388,183
Lamp, arc, V. C. Killin.... 388,058
Lamp, Argand, L. J. Atwood.... 388,105
Lamp burner flame extinguisher, L. J. Bullard.... 388,019
Lamp standard, Hammond & Merriam.... 388,195
Lamp standard, W. Patzer.... 388,218
Last block fastener, W. Cook.... 388,182
Lathe for turning articles having longitudinally curved surfaces, C. A. Benedict.... 388,110
Lawn rake, J. W. Calef.... 388,179
Lemon squeezer, C. M. Footlit.... 388,352
Lifting jack, B. F. Nelson.... 388,067
Lifting jack, W. Tucker.... 388,090
Lifting jack, A. A. Strom.... 388,156
Lifting jack, C. E. Bradley.... 388,176
Lock. See Hasp lock. Nut lock. Seal lock.
Loom let-off mechanism, J. Morton.... 388,215
Loom shedding mechanism, Stafford & Barrett.... 388,318
Loom temples, manufacturing rings for, E. S. Stimpson.... 388,155
Looms, harness depressing device for, Stafford & Barrett.... 388,319
Looms, shuttle binder for, E. Barsalou.... 388,243
Lounge, extension, B. Rumpel.... 388,223
Lubricator. See Axle lubricator.
Mail bag catcher, Gollehon & Bonham.... 388,274
Malt kiln floor, W. Griesser.... 388,193
Match box, H. Gass.... 388,354
Mattress, air, J. R. Hargin.... 388,037
Metals by electricity, apparatus for working, N. Benardos.... 388,246

© 1888 SCIENTIFIC AMERICAN, INC.

Metals by electricity, working, N. Benardos..... 388,245
Metal wires and strips, machine for tempering, F. Sedgwick..... 388,078
Milk box, E. J. Colby..... 388,124
Mill. See Pug mill. Sawmill.
Mirrors, lighting device for toilet, H. S. Duff..... 388,346
Motor engine worked by combustible gas, vapor, or spray, N. A. Otto..... 388,302
Multiple switch board, M. G. Kellogg..... 388,052, 388,283
Music holder, G. Duebendorf..... 388,270
Nailing machine, L. Goddu..... 388,128
Nails, machine for making decorative, H. P. Fiske..... 388,126
Needle and cord, combined, E. A. Bailey..... 388,009
Numbering machine, consecutive, J. H. Reinhardt..... 388,307
Nut lock, C. M. Baldwin..... 388,332
Nut lock, W. Kail..... 388,051
Oil can holder, E. A. Durfey..... 388,348
Paper barrel, A. Brab..... 388,113
Paper barrels, machine for moulding, J. F. Seiberling..... 388,079
Paper holder for duplicating devices, R. J. Wallace..... 388,326
Paper reel, H. T. Wilson..... 388,236
Pencil leads, etc., holder for, C. W. Boman..... 388,015
Photographic plate holder, G. Eastman..... 388,271
Pianoforte, J. P. Richardson..... 388,308
Picture frame, E. Dietrich..... 388,027
Pipe. See Tobacco pipe.
Pipe coupling, flexible, R. Bodycomb..... 388,112
Pipes and boilers, covering for steam, P. Carey... 388,260
Planing machine, Woods & Thomas..... 388,169
Planing machines, sectional adjustable pressure bar and chip breaker for wood, C. S. Warner.. 388,094
Planter, check row corn, L. A. Aspinwall..... 388,104
Planter, seed, F. W. Ayers..... 388,331
Plate holder, W. H. Lewis..... 388,057
Plew, Wied & Lurssen..... 388,165
Plow, sulky, S. M. Campbell..... 388,120
Pole attachment for vehicles, W. P. Fest..... 388,189
Post. See Fence post.
Powder dusting machine, E. A. Dodgson..... 388,184
Powder filler, G. Blum..... 388,249
Printer's galley, F. Schley..... 388,224
Printing blocks, composition for polychromatic, W. G. & R. A. A. White..... 388,099
Printing machines, feed guide for, J. T. Hawkins 388,038
Printing machines, operating mechanism for type beds of cylinder, Kahler & Brookes..... 388,050
Printing roller machine, hand, J. H. Eiermann.... 388,031
Pruning implement, A. Bethscheider..... 388,111
Pug mill, H. Woodcock..... 388,167
Pulley, split, W. L. Field..... 388,190
Pulverizer, wheeled, E. Elliott..... 388,349
Pump, Arnold & Hill..... 388,239
Punching device, check, R. Spencer..... 388,085
Puzzle, L. E. Simpson..... 388,226
Rack. See Hay rack.
Rail chair for girder rails, R. W. Welch..... 388,097
Rail fastening, G. H. Barge..... 388,241
Rail fastening, J. Quinn, Jr..... 388,220
Rails into angle bars, rolls for converting old, A. Vaughan..... 388,332
Railing and guard, metallic, A. Bataille..... 388,108
Railway, cable, E. C. Phillips..... 388,072
Railway, cable, Shobe & Embley..... 388,081
Railway rail, G. A. Ewing..... 388,188
Railway rail joint or chair, J. M. & S. B. Moody... 388,063
Railway signal, T. P. Curry..... 388,023
Railway tie and rail fastening, J. R. Millhouse.... 388,296
Railway tie, metallic, A. J. Hartford..... 388,277
Railways, construction of, E. H. Ashcroft..... 388,240
Railways, current collector for electric, J. L. Blackwell..... 388,247
Rake. See Lawn rake.
Reel. See Centrifugal reel. Paper reel. Wire reel.
Register. See Cash register.
Regulator. See Temperature regulator.
Ring. See Curtain ring.
Rock drill support, P. Kelly..... 388,203
Roll housing, W. R. Jones..... 388,049
Rolling mills, guide for, L. Chapman..... 388,121
Rotary engine, J. Marvin..... 388,210
Rotary engine, J. C. Robertson *et al*..... 388,309
Rotary engine, L. J. Strait..... 388,379
Salesman and changemaker, automatic, Morse & Chase..... 388,369
Saw, Ralya & Heinold..... 388,305
Sawmill, band, W. F. Parish..... 388,069
Saw swage, Richer & Adams..... 388,221
Sawing apparatus, J. S. Hendrickson..... 388,039
Scale and coin tester, letter, E. Knight..... 388,138
Screen. See Extension screen. Folding screen.
Seal lock, L. A. Brown..... 388,258
Seal lock, G. W. Lewis..... 388,208
Secondary battery, J. Beattie, Jr..... 388,335
Sectional boiler, J. D. Mouat..... 388,370
Seeding and cultivating machine, combined, W. Dickinson..... 388,026
Selling machine, J. A. Williams..... 388,101
Sewing machine, J. Vannett..... 388,324
Sewing machine buttonhole attachment, W. M. Ammerman..... 388,172
Sewing machine buttonhole attachment, J. L. Smith..... 388,316
Sewing machine feeding mechanism, P. Diehl.... 388,345
Sewing machine thread unwinder, C. E. Wilkinson..... 388,328
Sewing machines, oscillating hook for, J. Vannett..... 388,323
Shelf, S. J. Murphy..... 388,066
Sheller. See Corn sheller.
Shingle painting apparatus, L. Siebert..... 388,082
Ships, apparatus for recovering valuable contents from sunken, J. H. Brown..... 388,257
Ships, recovering valuable contents from sunken, J. H. Brown..... 388,256
Sign, window, G. H. Babcock (r)..... 10,952
Signal. See Railway signal.
Signaling, electric, C. Ader..... 388,008
Skate, J. H. Young..... 388,170
Slate, school, J. Hackenberg..... 388,129
Sled, dumping, R. Gregg..... 388,192
Sling, trip, J. Byrne..... 388,021
Snap hook, E. Bradley..... 388,254
Soda ash furnace, J. F. Kennedy..... 388,284
Sodium chlorate, manufacture of, Muspratt & Eschellmann..... 388,217
Soldering iron, self-heating, T. W. Eversole..... 388,187
Sole laying machines, pad for, A. F. Smith..... 388,377
Spinning mule, Kimball & Hersey..... 388,054
Spring. See Watch case spring.
Springs, making double loop, H. Torley..... 388,160
Stamping apparatus, mail, Laas & Hey..... 388,366
Station indicator, G. C. Logan..... 388,209
Station indicator, M. L. Mann..... 388,058
Steam boiler, J. G. Bryan..... 388,340
Steam boiler, S. P. Hedges..... 388,198
Steam engine, R. H. Mather..... 388,059
Stereotype plates for printing, block for locking, H. Fietsch, Jr..... 388,032
Stone gatherer and potato digger, self-loading, E. Crane..... 388,342
Stool, W. J. Melvin..... 388,060
Syringe, J. A. Dunn..... 388,029
Telegraph, automatic fire, J. H. Guest..... 388,358
Telegraph, fire, J. H. Guest..... 388,357
Telegraph, printing, J. M. E. Baudot..... 388,244
Telegraph receiver, W. T. Barnard..... 388,333
Telegraph receiver, F. Van Rysselberghe..... 388,092
Telegraphy, harmonic, F. Van Rysselberghe..... 388,091
Temperature regulator, H. J. Gebhardt..... 388,034
Temperature regulator, automatic, O. Bohm..... 388,250
Thill coupling, Miller & Wright..... 388,144
Threshold and weather strip combined, G. B. Williamson..... 388,330
Thrust block, S. N. Smith..... 388,227
Tie. See Railway tie.
Tobacco pipe, H. J. Sorensen..... 388,084
Tobacco pipe, T. B. Whitledge *et al*..... 388,235
Tool holding box, Bartlett & Peck..... 388,334
Tooth, artificial, Day & Rogers..... 388,269
Torpedo boats, electric steering apparatus for, O'Kelly & Collins..... 388,300
Torpedoes, means for operating marine, O'Kelly & Collins..... 388,299
Torpedoes on railway tracks, apparatus for placing, J. R. H. Hinton..... 388,199
Track crossing, rotary, F. J. Hoyt..... 388,135
Transplanter, C. E. Tobey..... 388,321
Transplanting trees, device for, Stanley & Gulley. 388,154
Trap. See Animal trap.
Truck, car, J. N. Weikly..... 388,095
Truck, passenger car, L. K. Jewett..... 388,046
Trucks, safety shoe for car, A. M. Woodruff..... 388,168
Truss, H. W. Kriete..... 388,365
Tub. See Wash tub.
Tumbler washer, A. Blair..... 388,248
Type production, relief, J. W. Hoke..... 388,361
Type writer, electrical, J. F. McLaughlin, 388,140 to 388,143
Valve, balanced slide, J. C. Askren..... 388,103
Valve, cylinder relief, G. H. Corliss..... 388,261
Valve gear, E. Korting..... 388,290
Valve gear, H. F. Shaw..... 388,089
Valve gear, cut-off, G. B. Rait..... 388,304
Valve, slide, W. A. Robinson..... 388,374
Valve, steam engine, G. H. Corliss..... 388,265
Vehicle gear, H. C. Swan..... 388,380
Vehicle reach bar, H. M. Hughes..... 388,363
Vehicle, two-wheeled, F. B. Lay..... 388,291, 388,292
Vehicle, two-wheeled, J. R. Bartruff..... 388,107
Vehicle wheel, A. H. Overman..... 388,068
Vehicle wheel scraper, J. Sparrow..... 388,378
Velocipede, H. E. House..... 388,043
Velocipede, Johnson & Hanson..... 388,047
Velocipede, Johnson & Fyrberg..... 388,048
Ventilating cover, J. Davies..... 388,024
Wagon jack, J. A. Corey..... 388,341
Wagon running gear, Keech & Laberdee..... 388,282
Wash tub, Torrance & Wells..... 388,089
Washer. See Tumbler washer.
Washing machine, D. K. Breazeale..... 388,114
Washing machine, J. W. Lasswell..... 388,207
Watch, H. Hammarlaud..... 388,036
Watch case spring, C. Teske..... 388,157
Watch, stem winding and setting, J. Duplain..... 388,183
Water closet seats and other seats, extension leg for, C. R. Schmidt..... 388,076
Water cooler and filter, J. H. Dumont..... 388,347
Water elevator, automatic, F. J. Case..... 388,261
Ways, construction of permanent, Cowdery & Thomas..... 388,266
Well, H. Piering..... 388,219
Wheel. See Car wheel. Chain wheel. Fifth wheel. Vehicle wheel.
Whip socket, J. Lathrop..... 388,368
Window shades, bottom bar for, M. A. Higgins... 388,041
Wire reel, Wilson & Walton..... 388,383
Wood drying kiln, A. & E. L. Wyckoff..... 388,102
Woodworking machine, S. F. Tibbetts..... 388,320
Yarn and for testing the strength of the same, device for cleaning and compacting, Offroy & Pfeiffer..... 388,298
Yarn hanking machine, Dart & Lewis..... 388,267

DESIGNS.

Cane head, J. Eichel..... 18,540
Card, campaign, F. E. Housh..... 18,550
Carpet, E. Fisher..... 18,541 to 18,546
Carpet, C. W. Swapp..... 18,552 to 18,557
Collar, G. H. Barnard..... 18,539
Glass, beveled O. C. Hawkes..... 18,549
Handkerchief, S. B. Turpin..... 18,558
Hot water heater, E. Gurney..... 18,547, 18,548
Truck, frame, car, J. Stephenson..... 18,551

TRADE MARKS.

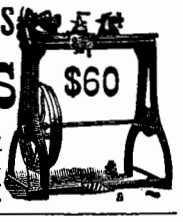
Buttons, pearl, Ostheimer Brothers..... 15,806
Candles, Dearborn Manufacturing Company..... 15,791
Cement, hydraulic, J. Robinson & Co..... 15,807
Cigars, G. G. Cuervo..... 15,795
Extracts of meats, J. Maggi & Co..... 15,799
Flour, D. M. Gedge..... 15,800
Ginghams, tickings, and cottons goods, J. Farnum & Co..... 15,793
Medicinal preparation to be used either as a potion or a lotion, G. F. Hutchinson & Co..... 15,796
Medicine for the treatment of gonorrhea and gleet, J. S. Broas..... 15,789
Milk, condensed, New York Condensed Milk Company..... 15,801
Oysters, shucked raw and hermetically sealed, J. Ludington & Co..... 15,798
Paint manufactured from the red oxide of iron, metallic, Clinton Metallic Paint Company..... 15,790
Pens, steel, Ormiston & Glass..... 15,805
Perfumes, and odoriferous and flavoring extracts, Nonantum Worsted Company..... 15,802, 15,803
Prints and cotton piece goods, Arnold Print Works..... 15,786, 15,787
Soap or compound of an abrasive character, cleansing, Electron Manufacturing Company.. 15,792
Tea, J. Friess..... 15,794
Toilet powder, G. Lorenz..... 15,797
Whisky, Blake, Bruce & Co..... 15,788
Woolens, jeans, and like goods. Old Kentucky Woolen Mills Company..... 15,804

A Printed copy of the specification and drawing of any patent in the foregoing list will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated, the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

SEBASTIAN, MAY & CO'S
Improved Screw Cutting
Foot & Power **LATHES** $60

Drill Presses, Chucks, Drills, Dogs, and machinists' and amateurs' outfits. *Lathes on trial.* Catalogues mailed on application.
165 W. 2d St., Cincinnati, O.

TOOLS Scroll Saws, Foot Lathes, Tools and Supplies for Amateurs and Machinists. Catalogue FREE.
Novelty Tool Co., 177 Elm St., Cincinnati, O.

ETIOLOGY OF SCARLET FEVER.—A lecture by Dr. E. Klein, F.R.S., on the communicability of scarlet fever through the use of milk derived from cows to which a mild form of the disease has been given by man. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **629.** Price 10 cents. To be had at this office and from all newsdealers.

ARTESIAN
Wells, Oil and Gas Wells, drilled by contract to any depth, from 5 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 600 ft. Send 6 cents for illustrated catalogue.
Pierce Well Excavator Co. New York.

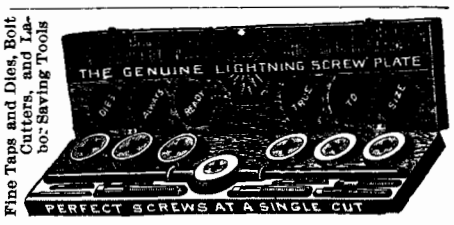
TRAMWAY, FLEXIBLE GIRDER.—Description of an improved system of constructing a modification of the well known and extensively used rope or wire tramway. With 21 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **595.** Price 10 cents. To be had at this office and from all newsdealers.

OIL WELL SUPPLY CO. Ltd.
91 & 92 WATER STREET, Pittsburgh, Pa.,
Manufacturers of everything needed for
ARTESIAN WELLS
for either Gas, Oil, Water, or Mineral Tests, Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists and discount sheets on request.

INFLUENCE MACHINES.—A PAPER by James Wimshurst, giving a complete account of the recent forms of generators of static electricity. With 13 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **647.** Price 10 cents. To be had at this office and from all newsdealers.

DELAFIELD'S PAT. SAW CLAMP

With saw for cutting metals. Saves all the broken hack-saw blades. In use over two years in all parts of the country. The new clamps have the edges bevelled that hold the saw. By mail, with one blade, 50 cents. Extra blades 8½" x ½", "Star," 7 cents each, 70 cents per dozen, by mail. Blades 8" x 1", "Stubs," 35 cents each, by mail. Discount to dealers.
NOROTON MFG. WORKS, Noroton, Conn.

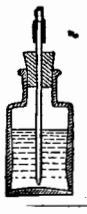


Fine Taps and Dies, Bolt Cutters, and Labor-Saving Tools
Wiley & Russell Mfg. Co., Greenfield, Mass.

STORAGE BATTERIES FOR ELECTRIC LOCOMOTION.—A paper by A. Reckenzaun, offering a few facts and figures relating to the present state of the subject of the application of storage batteries to locomotive purposes. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **625.** Price 10 cents. To be had at this office and from all newsdealers.

GUILD & GARRISON
BROOKLYN, N. Y., U. S. A.
Builders of **Steam Pumps** for Water and every description of Liquids or Semi-liquids. **Vacuum Pumps** of the highest efficiency. **Filter Press Pumps, Air, Gas, and Acid Blowers. Air Compressors. Boiler Feed Pumps, etc.**

FIFTY YEARS' PROGRESS IN TELEGRAPHY.—By W. H. Preece, F.R.S. An interesting historical paper. Improvements in apparatus. Telephones, Pneumatic telegraphs, Cables, Railway telegraphs. Capital invested in telegraphs. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **607.** Price 10 cents. To be had at this office, and from all newsdealers.


KEUFFEL & ESSER, New York,
INDELIBLE DRAWING INKS.
Black, Brown, Blue, Green, Scarlet, Carmine, Yellow.
The best ever produced. Have our Patent Ink Filler, which regulates supply to pen; prevents soiling outside of pen-blades; is the only cleanly device for filling pens. Sample assortment, seven vials (of above colors), mailed on receipt of **50** cents.

HISTORY OF THE ELECTRICAL ART in the U. S. Patent Office.—By C. J. Kintner. An interesting history of the growth of electrical science in this country, and notices of some of the more important models in possession of the Patent Office. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. **544.** Price 10 cents. To be had at this office and from all newsdealers.

USEFUL BOOKS.
Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has recently been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy, have only to ask for it, and it will be mailed to them. Address,
MUNN & CO., 361 Broadway, New York.

The DUNNING BOILER
Oldest and Best
FOR
Steam and Hot Water HEATING.
Over **13,500** in use.

Trade Mark.
MANUFACTURED BY
N. Y. Central Iron Works,
Lock Box 40,
GENEVA, N. Y.

THE MICHIGAN MINING SCHOOL, HOUGHTON, MICH.
This School offers a two years' practical course in Mining Engineering, Mineralogy, Petrography, General and Economic Geology, Chemistry, Assaying, Surveying, Mechanical Drawing, and related branches. In 1889 the course will be increased to three years for all students entering after 1888. The School, being centrally located in the Mineral Region of Lake Superior, affords special advantages for instruction in practical mining. The climate of the region is cool and healthful, and as the School is a State institution, the tuition is free. For catalogues and further information, address
M. E. WADSWORTH, Director.

INGERSOLL ROCK DRILL CO.,
10 PARK PLACE, NEW YORK.
Improved "Eclipse"
ROCK DRILLS,
For Mining, Tunneling, Shaft-Sinking, Quarrying, Submarine drilling, and for all kinds of rock excavation.
"Straight Line" AIR COMPRESSORS, Boilers, Steam and Horse Power Hoists, Electric Blasting Batteries and General Mining Machinery
Send for full descriptive Catalogue

LIMITING NUMBERS OF TEETH IN Gear Wheels.—A valuable paper by George B. Grant treating of the different methods of determining the limiting numbers of teeth in gear wheels when small pinions must be used. The cycloidal system. The interchangeable volute system. The non-interchangeable volute system. Unrevers ble teeth. With 11 figures. Contained in the SCIENTIFIC AMERICAN SUPPLEMENT, No. **592.** Price 10 cents. To be had at this office and from all newsdealers.

ROCK DRILLS
AIR COMPRESSORS &
GENERAL MACHINERY FOR
MINING, TUNNELING,
QUARRY & RAILROAD WORK.
RAND DRILL Co 23 PARK PLACE NEW YORK

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, **59.** Price 10 cents. To be had at this office and of all newsdealers.

Steam! Steam!
We build Automatic Engines from 2 to 200 H. P., equal to anything in market.
A Large Lot of 2, 3, and 4-H. Engines
With or without boilers, **low for cash,**
B. W. PAYNE & SONS,
Box 15, **Elmira, N. Y.**

WOOL HAT MAKING.—FULL DESCRIPTION of the process.—Wool washing, carding and forming, settling, dumping and washing out, stretching or stumping, drying, storing and steaming, pulling out, dyeing, blocking, storing, pressing, finishing, rounding, curling and ironing, paring, trimming and shaping, velouring off. With 20 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NOS. **626, 628,** and **629.** Price 10 cents each. To be had at this office and from all newsdealers.

PRINT Your Own CARDS PRESS $3. Circular size $8. Newspaper size $44. Type setting easy, printed directions. Send 2 stamps for catalogue presses, type, cards, &c., to factory, KELSEY & CO. Meriden, Conn.

AMMONIA SULPHATE.—A PAPER by Watson Smith, F.C.S., describing Gruneberg's apparatus and process for making sulphate of ammonia. With 3 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **566.** Price 10 cents. To be had at this office and from all newsdealers.

ELECTROTECHNICS, DEFINITIONS and Designations in.—A list of the symbols proposed by Mr. Jamieson for electrical units, magnetism, and electric measurements. With 4 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. **595.** Price 10 cents. To be had at this office and from all newsdealers.

Scientific Book Catalogue
RECENTLY PUBLISHED.
Our new catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.
MUNN & CO., Publishers Scientific American,
361 Broadway, New York.

GOING INTO THE POULTRY BUSINESS.—A paper by P. H. Jacobs, reviewing the commercial aspects of poultry raising, and giving many useful hints upon the subject. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **596.** Price 10 cents. To be had at this office and from all newsdealers.

ELECTRIC LIGHT AND POWER.
Edco system of Arc and Incandescent Lighting. Direct or in connection with the Storage Batteries of the Electrical Accumulator Co. Dynamos, Motors, Lamps, Batteries, and General Electrical Supplies.
THE ELECTRO DYNAMIC COMPANY,
224 Carter Street, Philadelphia, Pa.

© 1888 SCIENTIFIC AMERICAN, INC.

HENRY CAREY BAIRD & CO.
Industrial Publishers, Booksellers, and Importers,
810 Walnut St., Philadelphia, Pa., U. S. A.

☞ Our new and Revised Catalogue of Practical and Scientific Books, 80 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

VALUABLE BOOKS.

—:o:—

REED'S ENGINEERS' HAND-BOOK to the Local Marine Board. Examinations for certificates of competency as First and Second Class Engineers. By W. H. Thorn, Member of the N. E. C. Inst. of Engineers and Shipbuilders, with the answers to the Elementary Questions. Illustrated by 297 diagrams and 36 large plates. Twelfth edition, revised and enlarged. 1888.....**$4.50**

MECHANICS' AND ENGINEERS' POCKET BOOK of Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, including Areas, Squares, Cubes, and Roots, etc., Logarithms, Hydraulics, Hydrodynamics, Steam and the Steam Engine, Naval Architecture, Masonry, Steam Vessels, etc., Limes, Mortars, Cements, etc. Fifty-second Edition, 109th thousand. By Chas. H. Haswell. 1888.....**$4.00**

THE MECHANICIAN.—A treatise on the Construction and Manipulation of Tools, for the use and instruction of Young Engineers and Scientific Amateurs, comprising the arts of Blacksmithing and Forging, the Construction and Manufacture of Hand Tools, and the various methods of using and grinding them, and the various details of setting out work incidental to the Mechanical Engineers' and Machinists' Art. Illustrated by 147 engravings. By Cameron Knight. 1888.....**$7.25**

☞ *Any of the above books sent by mail, free of postage, at the published prices. Remit by draft, check, or postal order.*

☞ *Our complete catalogue of American and Foreign Practical and Scientific Books, 100 pages, including works on more than fifty different subjects will be mailed free and free of postage to any one on application.*

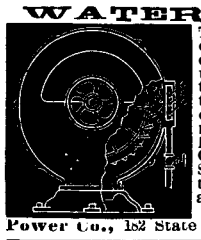
MUNN & CO.,
Publishers of Scientific American,
361 BROADWAY, New York.

PNEUMATIC DYNAMITE TORPEDO Gun.—An exhaustive account of this new weapon and of the experiments made with it; along with a description and illustration of a proposed dynamite cruiser, with 6 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **593**. Price 10 cents. To be had at this office and from all newsdealers.

WATCHMAKERS Send for REDUCED PRICE LIST of Whitcomb Lathes, date of July 1, 1888. American Watch Tool Co., Waltham, Mass.

HOME-MADE INCUBATOR.—PRACTICAL directions for the manufacture of an effective incubator that has been carefully tested and found to perform all that may be reasonably expected; with directions for operating. With 4 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **630**. Price 10 cents. To be had at this office and from all newsdealers.

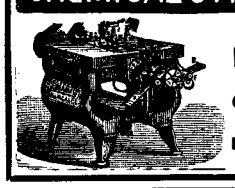
WATER MOTORS.



The most efficient and economical means of obtaining from one-eighth to fifteen horse power and upward. A motor which does the greatest amount of work with the use of the smallest stream of water, specially adapted for running cheaply and efficiently, Printing Presses, Elevators, Church Organs, Coffee Mills, Sewing Machines, Lathes, Dental Contrivances, and in fact, any piece of Mechanism.
Binghamton Hydraulic Power Co., 152 State Street, **Binghamton, N. Y.**

THE GENERATION OF STEAM.—A lecture by Geo. H. Babcock delivered in the Sibley College Course. I. The production of Heat. Furnaces for burning bituminous and anthracite coal, wood, sawdust, waste gas, natural gas, etc., described. II. The Generation of Steam. General principles to be observed in the construction of boilers. With 14 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **624** and **625**. Price 10 cents. To be had at this office and from all newsdealers.

NICKEL PLATING
& POLISHING MATERIALS.
ZUCKER & LEVETT
CHEMICAL Co NEW YORK U.S.A.



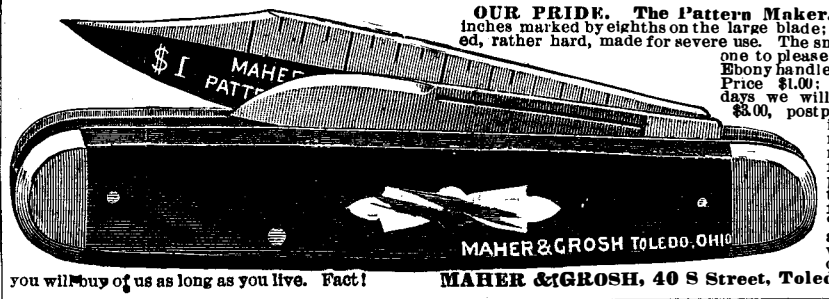
NICKEL ANODES, NICKEL SALTS, ROUGES, COMPOSITION, BUFFING WHEELS, ELECTRO & NICKEL PLATING OUTFITS.

A NEW CATALOGUE OF VALUABLE PAPERS
Contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent *free of charge* to any address.
MUNN & CO., 361 Broadway, New York.

GOVERNMENT BREEDING FARM FOR Cavalry Horses.—A paper by Lieut. S. C. Robertson, U. S. A., outlining a plan for the establishment of a breeding farm for horses maintained and controlled by the government, and discussing the economic features of the scheme. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **606**. Price 10 cents. To be had at this office and from all newsdealers.

PERFECT NEWSPAPER FILE
The Koch Patent File, for preserving newspapers, Magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN" in gilt. Necessary for every one who wishes to preserve the paper. Address
MUNN & CO., Publishers SCIENTIFIC AMERICAN.

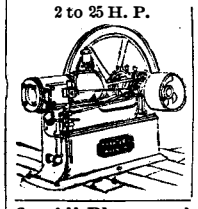
CURE for the DEAF by PECK'S PAT. IMPROVED CUSHIONED EAR DRUMS. Whispers heard distinctly. Comfortable, invisible. Illustrated book & proofs, FREE. Address or call on F. HISCOX, 853 Broadway, N. Y. Name this paper.



OUR PRIDE. The Pattern Maker. Has two inches marked by eighths on the large blade; oil-tempered, rather hard, made for severe use. The small blade is one to please mechanics. Ebony handle, metal ends. Price $1.00; but for 30 days we will sell 4 for $3.00, postpaid. Remit in what is most convenient. Send for our 48-page illustrated list, free; also "How to use a Razor." If we sell you one knife, you will buy of us as long as you live. Fact!
MAHER & GROSH, 40 S Street, Toledo, Ohio.

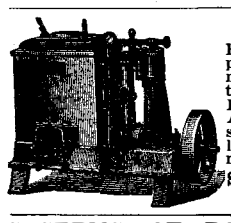
TELESCOPES—THEIR HISTORY and the discoveries made with them.—By Prof. E. S. Holden. An interesting historical paper, discussing the development of the telescope from the time of Galileo up to the present day. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **629**. Price 10 cents. To be had at this office and from all newsdealers.

CHARTER'S GAS ENGINE.
2 to 25 H. P.



The Simplest, most Reliable, and Economical Gas Engine in existence.
An impulse at every revolution. Perfect steadiness guaranteed for Arc or Incandescent Electric Lights.
Independent of gas works when desired, and **makes its own gas** at a cost of **65 cents per M feet**, or about **one cent per hour to each indicated H. P.**
A Perfectly Safe Motor for All Places and Purposes.
New York Agent, JOHN J. BOCKIE, 47 Dey Street.
Chicago Agent, H. H. LATHAM, 318 Dearborn Street.
Williams & Orton Mfg. Co.
P. O. Box 148. STERLING, ILL.

PANAMA CANAL.—A PAPER BY DR. W. Nelson on some of the difficulties to be overcome in the prosecution of this work. Damming the Chagres River. Extent of the earth cutting. Ocean tides. The climate. Prevalent diseases. Cost of the canal in lives. Cost of the work. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **603**. Price 10 cents. To be had at this office and from all newsdealers.



OIL ENGINES.
For Printers, Steam Yachts, pumping water, sawing wood, making ice-cream, Carpenters, Mechanics. 1 to 8 H. P. Fuel, Kerosene. **No dust.** Automatic in fuel and water supply. Illustrated Catalogue free. See illustrated notice in Sci. Am. Aug. 4, 1888.
SHIPMAN ENGINE CO.
92 Pearl St., Boston, Mass.

SYSTEMS OF DISTRIBUTION OF Electricity.—A lecture by Elihu Thomson, delivered in the Sibley College course. The series, multiple arc, series multiple and multiple series, accumulator and induction systems described, and their advantages and disadvantages discussed. With 18 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **603**. Price 10 cents. To be had at this office, and from all newsdealers.

THE PENNA. DIAMOND DRILL & MFG. CO. BIRDSBORO, PA., Builders of High Class Steam Engines. Diamond Drilling and General Machinery. Flour Mill Rolls Ground and Grooved.

THE NEW CROTON AQUEDUCT.—Detailed description of the great aqueduct now being constructed to increase the water supply of New York City, and also of the great dam which it is proposed to build across the Croton River, at Quaker Bridge. With engravings and a map. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **558**. Price 10 cents. To be had at this office and from all newsdealers.

Screw Plates. **Adjustable Die.**

Send for CATALOGUE F. F. F.
WELLS BROS. & CO., GREENFIELD, MASS.
MANUFACTURERS OF
Screw Cutting Machinery and Tools for Machinists', Carriage Makers', and Blacksmiths' Use.

CAMERA BELLOWS.—FULL DESCRIPTION. With 12 figures, by means of which any amateur can easily make a camera bellows for himself. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **625**. Price 10 cents. To be had at this office and from all newsdealers.

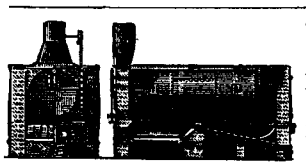
HODGE'S
Universal Angle Union
PATENTED.
Combining an elbow and union, and can be set at any angle at which it is desired to run the pipe.
Manufacturers & Wholesale Agents,
ROLLSTONE MACHINE CO., 48 Water St., FITCHBURG MASS.

AIR, PURIFICATION OF.—BY D. Prince, M.D. An experimental study in relation to the removal from the air of the dust or particulate material, supposed to produce yellow fever, small-pox, and other infectious disease. 1 illustration. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **569**. Price 10 cents. To be had at this office and from all newsdealers.

75 cents, by mail.

Makes a perfect Pipe Wrench of any screw wrench. Send for circular. Agents wanted. H. W. ATWATER, 38 Warren Street, N. Y. City.

The **TRENTON ENGINE** AUTOMATIC CUT-OFF BALANCE VALVE
Highest duty, economy, and durability guaranteed.
Phenix Iron Co. Trenton, N. J., M'f'rs.
F. VAN WINKLE, Agt., 91 Liberty St., N. Y.

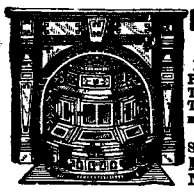


WEITMYER PATENT FURNACE
BOILERS OF EVERY DESCRIPTION.
IDE Automatic Engines, Traction and Portable Engines
STEAM ROAD ROLLERS.
Manufactured by **Foundry and Machine Department,**
Harrisburg, Pa., U. S. A.

PULLEYS, HANGERS, FRICTION CLUTCHES. PROGRESS MACHINE WORKS, A. & F. BROWN, 44 Park Place, N. Y.

SAWS How to **Straighten** and **Gum** all kinds. Address, A. E. WILBUR, Oneonta, N. Y.

WELL Encyclopedia of 700 Engravings of WELL TOOLS, Diamond Drills and Lightning Hydraulic WELL Machines. Book free, 25c. for mailing it. American Well Works, Aurora, Ill.



BIBB'S Celebrated Original BALTIMORE FIRE-PLACE HEATERS
To warm upper and lower rooms. The Handsomest and Most Economical Coal Stoves in the world.
B. C. BIBB & SON
Stove Founders, Baltimore, Md.
MARBLEIZED SLATE MANTELS
New and Beautiful Designs.

DUPLEX GAS REGULATOR CO. City, county, and state rights for sale. On exhibition at **105 West 41st Street, New York.**

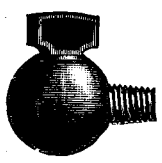
DISEASES OF DYNAMOS.—A PAPER by S. P. Thompson, D. Sc., discussing the maladies to which dynamo machines are liable, and their treatment, cure and prevention. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **627**. Price 10 cents. To be had at this office and from all newsdealers.

QUEEN & Co. MANUFACTURERS AND IMPORTERS 924 CHESTNUT ST PHILADELPHIA PENN'A
MAGIC LANTERNS
SCIOPTICONS
STEREOPTICONS
—FIRST CLASS—
PROJECTING APPARATUS
FOR SCHOOLS COLLEGES
AND PUBLIC ENTERTAINMENTS COPYRIGHT

$10.00 to $50.00 per night. A light and profitable business. **Magic Lanterns and Views** of popular subjects. Catalogues on application. Part 1 Optical. 2 Mathematical, 3 Meteorological, 4 Magic Lanterns, etc.
L. MANASSE, 88 Madison Street, Chicago, Ill.

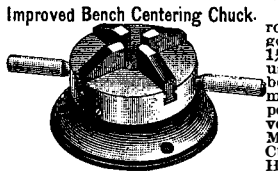
GAS ENGINEERING, RECENT PROGRESS in.—By A. Macpherson. Regenerative system of retort firing. Improvements in gas purification. Burners and regenerative lamps. The Welsbach gas light. Paraffin as a rival of coal gas, oil in gas making. Prices of residual products. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **601**. Price 10 cents. To be had at this office and from all newsdealers.

A PRACTICAL SUCCESS.
VAN DUZEN'S PAT. LOOSE PULLEY OILER.
Thousands in satisfactory everyday use. Entire reliability and constancy demonstrated in a two years' test by (would be) Eastern skeptics. Economy shown by reasonable prices and perfect performance. Send for our "Catalogue No. 55."
VAN DUZEN & TIFT, Cincinnati, O



IRRIGATING MACHINERY ON THE Pacific Coast.—By John Richards. An elaborate discussion of the modifications that have had to be made in irrigating machinery to meet the requirements of local conditions in California. Contained in SCIENTIFIC AMERICAN SUPPLEMENT Nos. **624** and **625**. Price 10 cents each. To be had at this office and from all newsdealers.

Improved Bench Centering Chuck.



Will perfectly center round, square, and octagon pieces from ¼ in. to 1½ in. One of the most useful, durable, and labor saving tools ever made for centering purposes, and is being universally used. Price $12. Manufactured by THE CUSHMAN CHUCK CO., Hartford, Conn.

GLACIAL EPOCHS AND THEIR PERIODICITY.—By Adolphe d'Assier. A presentation of the considerations that tend to establish the fact that the progressive cooling of the earth must, in the course of ages, have produced circumpolar glaciers, and that the periodic and alternate return of these in the two hemispheres is closely connected with the secular displacement of the perihelion. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **631** and **632**. Price 10 cents each. To be had at this office and from all newsdealers.

TO BUSINESS MEN.
The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN, when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done, for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.
For rates see top of first column of this page, or address
MUNN & CO., Publishers,
361 Broadway, New York.

ICE & REFRIGERATING Machines. York Patent. **YORK MFG. CO., York, Pa.**

Mayor's Office, City Hall,
BROOKLYN, N. Y., *August* 28, 1888.
Notice is hereby given that the time for the reception of designs for the Soldiers' and Sailors' Monument has been extended to October 10, 1888. Competitors must comply with the conditions of the competition on file in the office of the Mayor.
ALFRED C. CHAPIN, *Mayor.*
THOMAS B. RUTAN, *Chairman Memorial Committee.*
JOHN MCCARTY, *President Board of Aldermen.*

Coil-Boilers for the United States Navy.—NAVY DEPARTMENT, WASHINGTON, D. C., *August* 2, 1888.—The Navy Department, having in view the possible decrease in weight of machinery in vessels of war by the use of tubulous, sectional, or coil-boilers, has determined to adopt such boilers, if suitable can be found, for a portion of the steam-power of one or more of the vessels about to be built. To this end, manufacturers who wish to offer such boilers for use by the Department are hereby invited to furnish plans of the same adapted to an armored coast-defense vessel, on or before September 15, 1888. Plans must be accompanied by certificates that boilers of the same make are or have been in successful use at sea or on shore. Plans showing the space in the vessel available for boilers, particulars of the duty required, and other information, may be obtained upon application to the Bureau of Steam Engineering. The boiler which appears to the Department, after investigation, to be the best for the purpose, taking into account the evaporative efficiency, the dryness of the steam, the weight of the boiler, the weight of the water contained, the accessibility for repairs, the ease of making repairs, the simplicity and interchangeability of the parts, the space occupied, the ease of firing and of regulating the feed, the suitability for working in battery, the capability of long-continued steaming without cleaning, and the durability, will be adopted in the coast-defense vessel above mentioned, provided that the price, which must be stated when the plans are submitted, is satisfactory to the Navy Department. Such boilers as appear to possess merit will be tested by the Navy Department, if the manufacturers so desire, to determine which is the more suitable for the purpose. Manufacturers who wish their boilers to be tested must furnish a boiler of the type of one of those proposed for the vessel and prepare it for test, either at their own works or at such place as may be arranged with the Department. The expense of the test of the accepted boiler will be borne by the Navy Department, and the cost of the fuel used in the test of the second best will also be borne by the Navy Department. All other tests must be at the expense of the parties offering boilers for competition.
WILLIAM C. WHITNEY, *Secretary of the Navy.*

ARCHITECTURAL BOOKS.
Useful, Beautiful, and Cheap.

To any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and to persons about to build for themselves they will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Four bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price, $2.00 a volume. Stitched in paper covers. Subscription price, per annum, $2.50. Address and remit to
MUNN & CO., Publishers,
361 Broadway, New York.

FOR SALE.
An interest in an invention, consisting of a swinging metal weather-strip for a car window, which is utilized as a fastening by which the window may be left open at any elevation. It renders impossible the window becoming immovable through effects of moisture. When window is closed, it prevents it from rattling and excludes all dust and air. It has been approved by all master mechanics who have seen it, and is now on trial on one of the principal roads of the country. The present owner not being a business man, desires an associate so placed in business or so connected with railways that he can introduce and push the patent. Number of patent 380,126. Address **C. M.,** P.O. Box 773, New York.

TAKE THE MONON ROUTE BETWEEN Chicago and Indianapolis, Cin. Louisville, Indianapolis, Cincinnati, and all winter cities of Florida and the South.
E. O. McCormick, Gen. Pass. Agent, Chicago.

2nd MACHINERY List Sent.
N. Y. Mach'y Depot, Bridge Store 16, Frankfort St., N. Y.

MACHINERY PALACE OF THE PARIS Exhibition of 1889.—Description of the main gallery of the machinery Palace, and of the 362½ foot trusses which are to be used in its construction. With 2 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **594**. Price 10 cents. To be had at this office and from all newsdealers.

BARREL MACHINERY.
E. & B. HOLMES,
BUFFALO, N. Y.

Put an Electric Bell in your house or shop.
You can do it yourself with our Complete Outfit. Price $2 50
Outfit consists of 1 Electric Bell, 1 Battery, 1 Push Button, 100 feet Wire, and Staples for Wire.
C. E. JONES & BRO.,
55 & 57 Longworth, **CINCINNATI, O.**
It is important to us that you mention this paper.

COMPARATIVE VALUE OF STEAM and hot water for transmitting heat and power.—An elaborate discussion of the subject, by Charles E. Emory. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. **615**. Price ten cents. To be had at this office and from all newsdealers.

The Scientific American
PUBLICATIONS FOR 1888.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

The Scientific American (weekly), one year	$3.00
The Scientific American Supplement (weekly), one year	5.00
The Scientific American, Export Edition (monthly) one year	5.00
The Scientific American, Architects and Builders Edition (monthly), one year	2.50

COMBINED RATES.

The Scientific American and Supplement	$7.00
The Scientific American and Architects and Builders Edition	5.00
The Scientific American, Supplement, and Architects and Builders Edition	9.00

Proportionate Rates for Six Months.

This includes postage, which we pay. Remit by postal or express money order, or draft to order of
MUNN & CO., 361 Broadway, New York.

ELIXIR Grows Full Beard, Moustache and Hair in 20 days. Man, Woman, Girl or Boy. Anybody $5 a day. We mail a $5 size OUTFIT FREE for 40c. in stamps to pay charges. Smith Manf. Co., Palestine, Ills.

© 1888 SCIENTIFIC AMERICAN, INC.

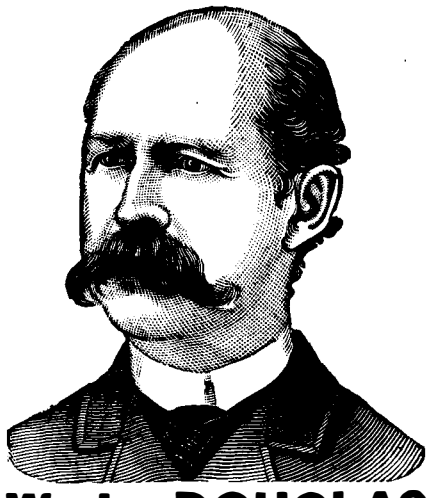
Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

CAUTION

Beware of Fraud, as my name and the price are stamped on the bottom of all my advertised shoes before leaving the factory, which protect the wearers against high prices and inferior goods. If a dealer offers **W. L. Douglas** shoes at a reduced price, or says he has them without my name and price stamped on the bottom, put him down as a fraud.



W. L. DOUGLAS $3 SHOE. FOR GENTLEMEN.

The only calf **$3 SEAMLESS** Shoe smooth inside. **NO TACKS** or **WAX THREAD** to hurt the feet, easy as hand-sewed and **WILL NOT RIP.**

W. L. DOUGLAS $4 SHOE, the original and only hand-sewed welt $4 shoe. Equals custom-made shoes costing from $6 to $9.

W. L. DOUGLAS $3.50 POLICE SHOE. Railroad Men and Letter Carriers all wear them. Smooth inside as a Hand-Sewed Shoe. No Tacks or Wax Thread to hurt the feet.

W. L. DOUGLAS $2.50 SHOE is unexcelled for heavy wear. Best Calf Shoe for the price.

W. L. DOUGLAS $2.25 WORKINGMAN'S SHOE is the best in the world for rough wear; one pair ought to wear a man a year.

W. L. DOUGLAS $2 SHOE FOR BOYS is the best School Shoe in the world.

W. L. DOUGLAS $1.75 YOUTH'S School Shoe gives the small Boys a chance to wear the best shoes in the world.

All made in Congress, Button and Lace. If not sold by your dealer, write

W. L. DOUGLAS, Brockton, Mass.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS. THOMAS DEVLIN & CO. FINE TINNING, JAPANNING AND FINISHING. LEHIGH AVE. & AMERICAN ST. PHILA.

HYATT FILTERS.

The Franklin Institute of Philadelphia has recently awarded **The Scott Legacy Premium Medal** to this Company for the **adaptability** of their **system** to the **Purification** of the **Water Supply of Cities.**

We call attention to the fact that over **twenty cities** (the two largest plants at present being

LONG BRANCH, NEW JERSEY,

and ATLANTA, GEORGIA)

are having the benefit of pure water, by the use of our system.

The largest Sugar Refineries, Paper Makers, and other Manufactories in all parts of the country have for years used our filters with great satisfaction and benefit.

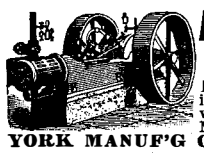
We have suits against the National, Jewell, and other Companies who infringe our patents.

HYATT PURE WATER COMPANY,
16, 18 & 20 Cortlandt St., N. Y. City.

TO INVENTORS AND MANUFACTURERS

The 57th Annual Exhibition
—OF THE—
American Institute of the City of New York
Will Open OCTOBER 3, 1888.

Intending Exhibitors must make early application to secure proper space and classification. For blanks and information, address **General Superintendent,**
American Institute, New York City.



Automatic Cut Off Engines
Horizontal and Vertical.
Specially adapted for **Electric Lighting. Yacht** and Hoisting Engines. Turbine water wheels. Constructors of Special Machinery of any description.
YORK MANUF'G CO., YORK, PA., U. S. A.

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

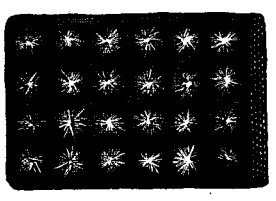
In this line of business they have had *forty-one years experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.



Patent Riveted Monarch Rubber Belting.

BEST IN THE WORLD.

Specially adapted for PAPER MILLS, SAW MILLS, and wherever a BELT of UNUSUAL STRENGTH is required.

THE GUTTA PERCHA AND RUBBER MFG. CO.
New York, Chicago, San Francisco.

This material is composed of tos, combined with water and and pressed into almost any de- It is superior in many respects nature on account of its resist- and as a non-conductor of elec- rings, washers, accumulator

VULCABESTON

the well-known mineral Asbes- acid proof materials, molded sired shape and then vulcanized. to other materials of a similar ance to heat, acid, and alkalies, tricity. For electrical plates, cells, etc., it is unsurpassed.

H. W. Johns Manufacturing Co.

87 Maiden Lane, New York,

SOLE MANUFACTURERS OF

H. W. Johns' Asbestos, Millboard, Sheathings, Building Felts, Fire-Proof Paints, Liquid Paints, Asbestos Roofing, etc.

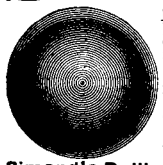
CHICAGO. PHILADELPHIA. LONDON.

SEAMLESS DRAWN COPPER TUBES. SHEET BRASS, BRASS WIRE. FINE TOOLS FOR MACHINISTS. DIES TAPS. SEND FOR CATALOGUE. 175 177 LAKE ST. CHICAGO.

Mention this paper.

THE COPYING PAD.—HOW TO MAKE and how to use; with an engraving. Practical directions how to prepare the gelatine pad, and also the antiline ink by which the copies are made; how to apply the written letter to the pad; how to take off copies of the letter. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **438.** Price 10 cents. For sale at this office and by all newsdealers in all parts of the country.

STEEL BALLS.



For Anti-Friction Bearings, of Best Cast Steel. Hardened, Ground, and Burnished, from 3-16 in. to 2 in. diameter.

In quality and density of metal, in uniformity of temper, and in accuracy and nicety of finish warranted unequaled.

☞ *Samples and prices on application.*

Simond's Rolling-Machine Co., Fitchburg, Mass.

PRESERVATION OF MEAT Without Cans—Egg shell method. Apply to DR. SALZER, 613 Park Ave., Baltimore, Md.

SEVERN AND MERSEY TUNNELS.—Full description of these two important engineering works, with two engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **604.** Price 10 cents. To be had at this office and from all newsdealers.

ERIE ENGINE WORKS WALNUT STREET ERIE PA MANUFACTURERS OF STATIONARY-PORTABLE-AGRICULTURAL-ENGINES STATIONARY-PORTABLE-VERTICAL-BOILERS.

THE AGE OF THE STARS.—BY Prof. Janssen. History of the discoveries that have led to the introduction of the doctrine of evolution in the science of astronomy. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **630** and **631.** Price 10 cents each. To be had at this office and from all newsdealers.

Novelty Hot Air Furnaces.

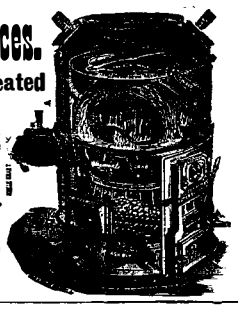
Expose an Immense Heated Surface.

Extract all the Heat from the Gases. Furnish Pure Warm Air in Abundance.

Fourteen Years of Test. Universally satisfactory.

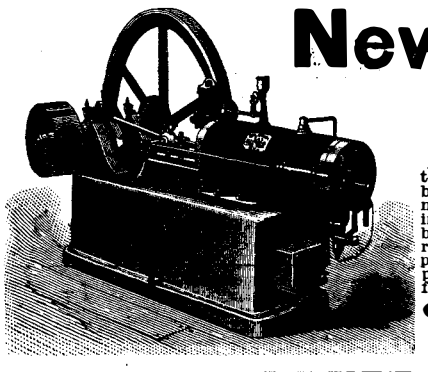
Send for "Our Furnace Book."

Abram Cox Stove Co.,
MANUFACTURERS,
Philadelphia and Chicago.



THE PHONOGRAPH.—A DETAILED description of the new and improved form of the phonograph just brought out by Edison. With 8 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **632.** Price 10 cents. To be had at this office and from all newsdealers.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD. CONN.



New Gas Engine "The Baldwin"

Exhibited at the late American Institute Fair, New York.

A four horse-power engine in connection with storage battery, running 84 incandescent electric lights (and without battery, 32 lights), giving a perfect light, with all the steadiness that can be obtained from the high-speed steam engines in common use for electric lighting, and permitting any number of lights to be shut off or turned on without affecting the remaining lights in the slightest degree. A marvel of beauty, perfection, and power, adapted to lighting, pumping, and all purposes where a safe and cheap power is required. Manufactured and guaranteed by

Otis Brothers & Co.
Elevators and Hoisting Machinery,
38 PARK ROW, NEW YORK.

RAILS FOR STREET RAILROADS.—A paper by A. W. Wright, C.E., discussing the comparative value of iron and steel as materials for street railroad rails. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **499.** Price 10 cents. To be had at this office and from all newsdealers.

MACHINISTS' SUPPLIES. SEND 13 CENTS FOR ILLUSTRATED CATALOGUE. MONTGOMERY & CO 105 FULTON ST. N.Y. LATHES CHUCKS DRILLS TOOLS SCREWS CALLIPERS ETC

ESTABLISHED HALF A CENTURY.

MARVIN'S FIRE & BURGLAR SAFES

HAVE MANY PATENTED IMPROVEMENTS NOT FOUND IN OTHER MAKES THAT WILL WELL REPAY AN INVESTIGATION BY THOSE WHO DESIRE TO SECURE THE BEST SAFE

MARVIN SAFE CO.

NEW YORK, PHILADELPHIA, LONDON, ENGLAND.

INVENTORS and others desiring new articles manufactured and introduced, address P. O. Box 86, Cleveland, O.

THE AMERICAN BELL TELEPHONE CO.

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.

Wheels and Rope for conveying power long distances. Send for circular.

The Original Unvulcanized Packing.

CALLED THE STANDARD—As it is the Packing by which all others are compared.

Accept no packing as JENKINS PACKING unless stamped with our "Trade Mark."

JENKINS BROS. 71 John Street, N. Y. 105 Milk Street, Boston. 21 North 5th St., Phila. 54 Dearborn St., Chicago.

ICE and REFRIGERATING MACHINES

The Pictet Artificial Ice Company (Limited), Room 6, Coal & Iron Exchange, New York.

CHALLENGE EMERY GRINDING POLISHING MACHINERY THIRD AND CUMBERLAND PHILA.

BRASS WORK Small Brass Work & Models A Specialty, Also Nickel Plating. T. L. McKEEN, Easton, Penn.

SYRACUSE MALLEABLE IRON WORKS W. B. BURNS PROP'R

JAMES B. EADS.—AN ACCOUNT OF the life and labors of this eminent engineer. With a portrait. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **592.** Price 10 cents. To be had at this office and from all newsdealers.

AUTOMATIC CUT OFF ENGINES PERFECTLY GOVERNED MANUFACTURED UPON SCIENTIFIC AND PRACTICAL PRINCIPLES BALL ENGINE CO. ERIE PA.

SAWS Wanted 50,000 Sawyers and Lumbermen to send us their full address for a copy of Emerson's ☞ Book of **SAWS.** We are first to introduce NATURAL GAS for heating and tempering **Saws** with wonderful effect upon improving their quality and toughness, enabling us to reduce prices. Address **EMERSON, SMITH & CO. (Ltd.), Beaver Falls, Pa.**

Barnes' Patent Foot Power Machinery.
WORKERS OF WOOD OR METAL,
without steam power, by using outfits of these Machines, can bid lower, and save more money from their jobs, than by any other means for doing their work. Also for
Industrial Schools or Home Training.
With them boys can acquire practical journeymen's trades before they "go for themselves." Price-List Catalogue Free.
W. F. & JOHN BARNES CO.,
No. 1999 Ruby St., Rockford, Ill.

THE
Scientific American
ESTABLISHED 1846.
The Most Popular Scientific Paper in the World.

Only $3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete List of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway, New York.

THE
Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Single copies 10 cents. Address and remit by postal order, express money order, or check,

MUNN & Co., 361 Broadway, N. Y.,
Publishers SCIENTIFIC AMERICAN.

Builders Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid **Magazine of Architecture,** richly adorned with *elegant plates in colors*, and with other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by al newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.

© 1888 SCIENTIFIC AMERICAN, INC.